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Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

JAMES FRANKLIN COLLINS
CHARLES ALFRED WEATHERBY } Associate Editors
LUDLOW GRISCOM

VOLUME 36

1934

The New England Botanical Club, Inc.
8 and 10 West King St., Lancaster, Pa.
Room 1001, 53 State St., Boston, Mass.

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Vol. 36. January, 1934. No. 421.

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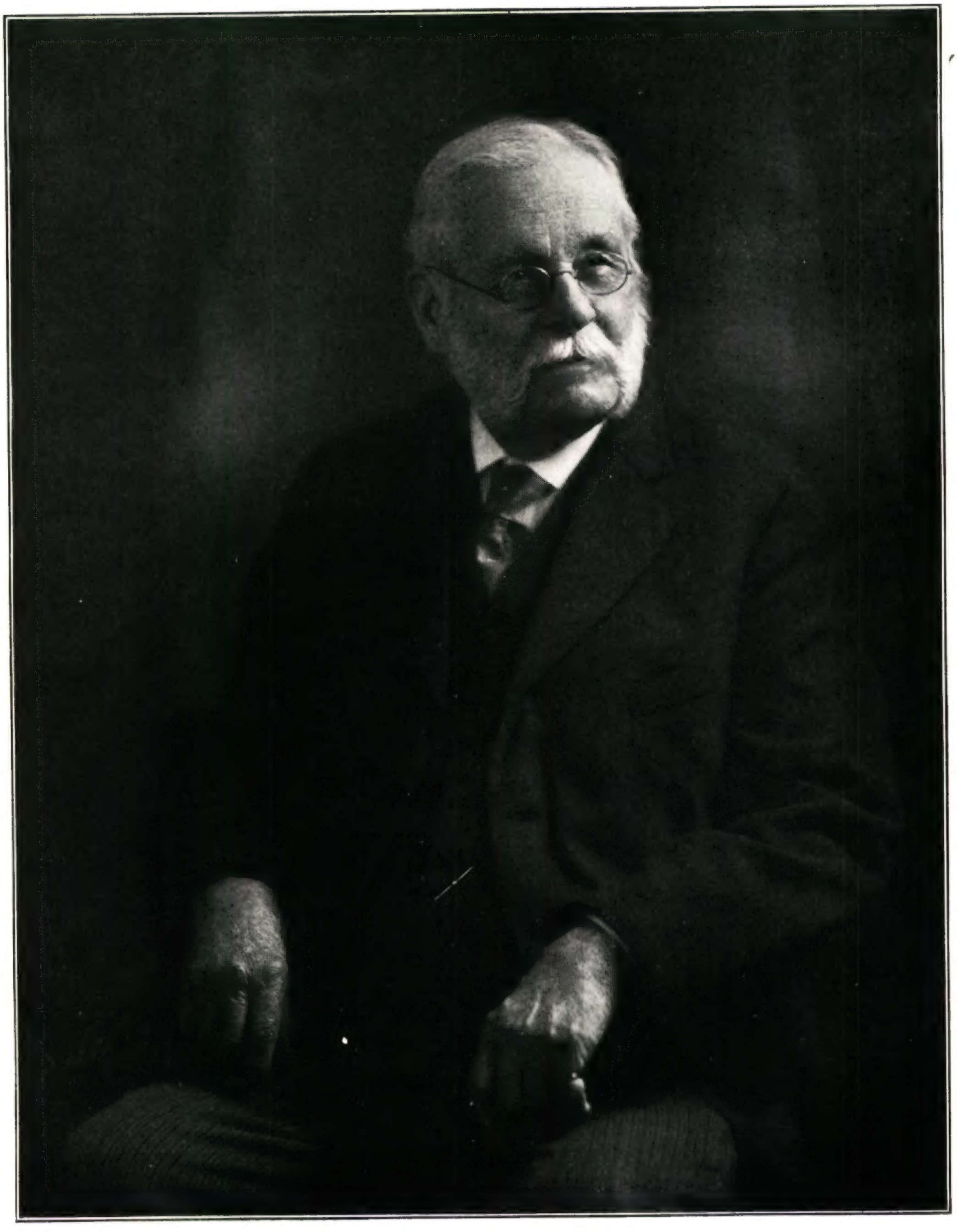


Photograph by Bachrach

Yours Sincerely

J. H. Thornhill

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. January, 1934. No. 421.

JOSEPH RICHMOND CHURCHILL

CLARENCE HINCKLEY KNOWLTON

(With Photographs)

AT the time of its organization, December 10, 1895, the New England Botanical Club was especially fortunate in securing as charter members a substantial and active group of amateurs, as well as the professional botanists of the period. George E. Davenport, Edward L. Rand, Walter Deane, Honorable Joseph R. Churchill, Frank S. Collins, Nathaniel T. Kidder, Dr. George G. Kennedy, Emile F. Williams, Edwin Faxon and Charles E. Faxon, and Lorin L. Dame; these were a group of business and professional men deeply interested in botany as an avocation. Such men would have brought strength to any organization. Most of them lived for many years to share in the interests of the Club and to promote its welfare.

It is to commemorate the life and interests of one of these men that this biographical sketch has been prepared. Joseph Richmond Churchill was born in Dorchester, Massachusetts, July 29, 1845. He was the son of Asaph Churchill, lawyer and banker, descendant of an old Plymouth family. His school life was uneventful. As a youth he became an ardent collector of insects, and devoted much of his leisure to that fascinating pursuit. Entering Harvard College, he received his A.B. degree in 1867. Science was beginning to receive some attention at Harvard, and during the latter part of his course young Churchill studied botany under Asa Gray.

An old book on student life in the college of those days says: "If a man had any accomplishment to perfect, or any fancy to please,

the Junior year used to be the time in which of all others he could carry out his plans. . . . . If one falls in with a pair of students miles away from Cambridge, tramping through woods and over fields, collecting specimens of plants or minerals or insects, they are sure to be Juniors—complacent, dignified, happy Juniors. At least, it used to be so in those days." I like to think of young Churchill as such an energetic Junior.

After finishing the Law School course at Harvard in 1869, the young man was admitted to the bar and began the practice of law in partnership with his father, in Boston. On January 9, 1871, Governor Claflin appointed the young lawyer a justice of the Municipal Court, Dorchester District of Boston. Some comment was made at the time on account of the youth of the new Judge, but Judge Churchill assured his critics that he would endeavor to surmount that difficulty, and he did so successfully, serving for sixty consecutive years, and retiring on the anniversary of his appointment. Dorchester was a quiet New England suburb in those days, with a population of 12,000 people, but at the time of his retirement it had a population of 187,000, with all the complicated problems of modern urban life. The Judge grew with his position, and administered his office with unsurpassed dignity.

The appointment made it possible for Judge Churchill to marry. He had become engaged to Mary Cushing, daughter of Dr. Benjamin Cushing of Dorchester, and the wedding took place on February 21, 1871, soon after the appointment. Dr. Cushing built a house for the young people beside his own, on Meetinghouse Hill in Dorchester, and they made it their lifelong home. Three children were born to them, one of whom survives the Judge, Dr. Anna Q. Churchill, who is Professor of Microscopical Anatomy at Tufts College Medical and Dental School.

As his private legal practice Judge Churchill specialized in mortgages, and became a recognized expert. He idealized the mortgage as a means of grace for the mortgagor working for a home of his own, and as the best possible investment for the conservative investor. When the Massachusetts Coöperative Bank was organized in Dorchester he became its first president, and held the office for the rest of his life, more than 25 years. He also held the first shares ever issued by the bank.

Although Churchill studied botany at Harvard under Asa Gray,

he did not begin an herbarium at that time. In 1869, after explaining the relationship between columbine and buttercup to his interested fiancée, he began his collection by pressing both plants. About five hundred species were analyzed by the young couple during their engagement. Like many other amateurs, Judge Churchill began to mount his specimens on small sheets till he had about a hundred of them, some of which are still in existence. The oldest of these is *Oxalis Acetosella* from Campobello, in 1867. Then, after consultation at the Gray Herbarium, he adopted the standard size recommended by botanists there. He aimed to collect everything with his own hands, and did not care for exchanges. His idea was to go to the place where the flower grew and collect it there himself. In this way he built up an herbarium of 13,313 sheets, 146 of which were collected in 1932, the 87th year of his life. The Judge was very particular about the quality of his specimens. He collected them with great care, and spent many happy hours in putting them into press, and in straightening out leaves and petals.

The ultimate aim of this ardent collector was to collect with his own hands every species and variety listed in the area covered by Gray's Manual, but he often made excursions into outlying territory. The first real collecting trip away from home was in 1873 to find the saxifrages near Willoughby Lake in northern Vermont, where many inconveniences were suffered by the young couple in their primitive quarters. In fact, Mrs. Churchill often said that their vacations were always planned with some botanical objective, and often took them far from the comforts of home and of good hotels.

The island of Nantucket was a favorite place, visited again and again with most pleasing results. Berkshire County also attracted him early, and he first explored the fascinating region around Williamstown and Mt. Greylock. Later vacations took him to Lanesboro, near the center, and to Sheffield in the southern part of the county. But best of all places in Massachusetts he loved the Blue Hills where he had roamed as a boy, and they never failed to interest him. Two delightful summers were spent with his friend Charles Francis Jenney, Federal Judge, ornithologist and botanist, on the island of Monhegan, off the Maine coast.

Outside of his own state he liked Virginia best, and made many visits there, often in the spring. He loved especially the region around Norfolk, for in addition to botanical attractions at Virginia Beach

and elsewhere it was easy for him to visit Hampton Institute and listen to the negro spirituals as sung by the students there. This music held a peculiar charm for him. He also botanized much in Richmond and along the James River, at Lexington, the Natural Bridge and elsewhere in the Old Dominion. Insects and poison ivy disturbed him not, and a hot summer day held no terrors for him. Once at Kingston, Jamaica, when even the negroes were carrying parasols to protect them from the sun, he walked down the street in the early afternoon, and on his return remarked, "This is the only time I have ever been really warm enough."

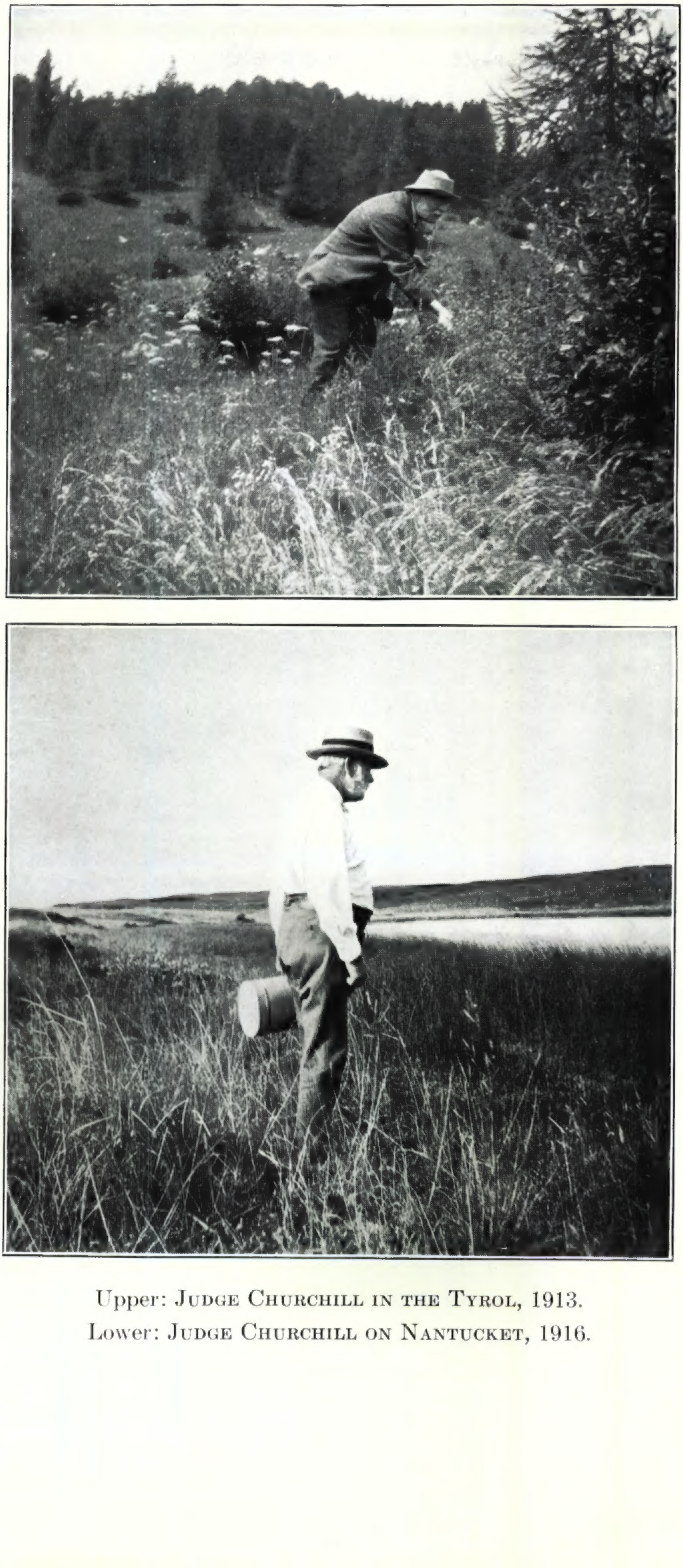
The regions at Baltimore, Maryland and Rehoboth, Delaware, of Tryon and Wilmington, North Carolina, Beaufort, South Carolina, Lookout Mt., Tennesee, Jacksonville and Tampa, Florida, were other southern places visited and explored.

"No Trespassing" signs were no deterrent to the Judge's botanical activities, but on one of his last visits to the Chicago region he was much hampered by the walls and fences which accompanied these signs. It was not till he had transferred himself to Lake Maxinkuckee in Indiana that he was satisfied with the conditions for collecting. One noteworthy visit to St. Louis in early summer was especially delightful. Dr. Jesse M. Greenman of the Missouri Botanical Garden arranged numerous botanical excursions which proved most satisfactory. The Judge's long friendship with Dr. Greenman had much influence with him when he finally decided to will his herbarium to the Garden.

Judge Churchill often persuaded other botanists to accompany him in his travels, and always made new friends. His herbarium, growing thus during more than sixty years, became a veritable storehouse of pleasant reminiscences of people and places.

Farther west were journeys to Madison, Wisconsin, Sault Ste. Marie, to Colorado, and two memorable visits to the Yellowstone National Park, the latter in 1930. The venerable Judge with his official permit to collect specimens, frequently delayed the starting of the bus, as he enthusiastically lingered to seize some especially attractive plant. He steadfastly refused to visit California, on the ground that it was not wild enough for his purposes.

In Canada there were many trips to Lake Memphremagog in Quebec. Rivière du Loup, the Bonaventure River in Gaspé, Bic and Lac Tremblant, Cape Breton and Prince Edward Island were also visited and explored.



Upper: Judge Churchill in the Tyrol, 1913.
Lower: Judge Churchill on Nantucket, 1916.

Two European journeys in 1907 and 1913 brought many botanical opportunities, with collecting in England, Wales, Germany, Italy, the Alps and the Dolomites. The Blumenthal above Mürren in Switzerland gave him the greatest bliss of all his many botanical experiences. The memory of that wonderful flowery vale was always associated in his mind with the much-loved Pastoral Symphony of Handel.

Judge Churchill enjoyed especially such field trips as were arranged by the Botanical Club from time to time, and seldom missed one of them. He did not look for easy assignments of territory on such occasions. At one time in his seventies he and the elderly R. W. Woodward of Connecticut chose to explore Breakneck Brook, as their share in the day's exploration, returning in fine condition with full boxes, to labor till late evening in getting the specimens into press. The Judge was a capital tramping companion. He was dignified and paternal in his bearing, but he was also vigorous, alert and persevering in the field. He had a quiet but by no means latent sense of humor. On one occasion, after walking along a mile or more of railway track with him, I reminded him of the Massachusetts statute by which vagrants against whom there is no other charge may be arrested for walking on the track. "Yes," said he, "that's the law, and I've often sent men up for breaking it. But I felt sorry for them. I like to walk on the railway track myself."

On one occasion a family that had been camping for some little time in Minot's Woods was brought into the Dorchester Court for vagrancy. "I suppose," said Judge Churchill, "that cases of this sort may be made of all of us who are addicted to camping in the summer. Of course we may not all be in such apparently straightened circumstances, or under such hard financial compulsion. But from the looks of the children they appear to be healthy, hearty and nice-looking children, who look as if they had enjoyed it. I therefore find the defendants not guilty."

In 1929 the Judge was criticised by a public official for his disposal of a drunken driver case. When the Judge was interviewed by the reporter, he said "The man is now in durance vile. We have got him off the roads. He is in jail, and I believe that the safety of the general public has been very well taken care of. What difference does it make whether he was sentenced to jail on the drunken driving complaint, or on any other complaint? He is in jail anyway."

The Judge used white labels for plants in the Gray's Manual area and the South, yellow labels for plants from beyond the Mississippi and blue labels for European specimens. He collected one or more duplicates of each plant when possible, and was very generous with them. He always saved one duplicate for his lifelong friend, Walter Deane. Thus, though his personal herbarium was bequeathed to the Missouri Botanical Garden, there are specimens of most of his important finds in the New England Botanical Club Herbarium or the Gray Herbarium. His plants are often cited by systematic botanists.

In 1887 he prepared a very accurate list of the plants growing in the town of Milton for inclusion in the town history. Later he made a careful study of *Leguminosae*, *Scrophulariaceae* and *Verbenaceae* as they occur in New England, and published checklists of them in RHODORA. He also wrote for RHODORA a most readable account of the excursion to Mt. Katahdin undertaken by five members of the Botanical Club in 1900. Other notes are scattered through the thirty-odd volumes of RHODORA. A most interesting article in September, 1921, tells of his discovery of *Cimicifuga racemosa* in Sheffield, Massachusetts, with a half-tone plate showing the good Judge in the midst of the vigorous plants, and quite dwarfed by the towering spikes around him. He later re-discovered a station for this plant in Bernardston, Massachusetts. In 1902 a strange *Scutellaria* which he had found at Ft. Fairfield, Maine, was named in his honor *Scutellaria Churchilliana* Fernald. By a clause in his will $1000 from a trust fund will revert to RHODORA.

No account of our honored friend would be complete without reference to the music which meant so much to him. His mother (née Mary Buckminster Brewer) was most musical in her tastes, and he inherited his love through her. He had a fine tenor voice and belonged to the Cecilia Society and to the Handel and Haydn Society. He was a regular attendant at the Boston Symphony Concerts. He also became much interested in the Boston Music School Settlement, and often attended its concerts, which he greatly enjoyed. By the terms of his will a considerable share of a trust fund will revert to this Settlement.

Judge Churchill early learned to play the flute, and was often accompanied on the piano by Mrs. Churchill's sisters next door, Misses Susan and Annie D. Cushing. The marriage of Miss Annie D. Cushing to Dr. Edward D. Peters, an accomplished 'cellist, brought

another musician into the family. An instrumental trio was formed, with flute, piano, and 'cello, and every Sunday evening they played together. After the death of Dr. Peters, however, the Judge had no more heart for his flute, and put it away, though he still loved his music as dearly as ever. He often whistled a favorite air, Mendelssohn's Overture to the Fair Melusine, as he worked over his specimens.

The watchful care of his devoted wife and daughter eased many of the hardships of old age for him. One infirmity he really resented—the lameness which hindered him in his walking and made long tramps impossible, but fortunately this limitation was late in coming to him. He worked on his specimens in his sunny study, re-read his well-loved Dickens and Thackeray, and seized every opportunity to enjoy the music which was so dear to him. He was able to attend the annual meeting of the New England Botanical Club on Friday, February 3; he presided at the meeting of the Massachusetts Coöperative Bank the following Monday; and with his daughter attended the Tuesday afternoon Symphony Concert. A week later, as he was apparently recovering from a slight illness, he suddenly died, on February 14, 1933.

Judge Churchill and his wife were for many years members of the First Church in Dorchester (Unitarian). The funeral was held in the ancient meetinghouse. One of the most touching features of the service was the perfect rendering of Goin' Home and Swing Low, Sweet Chariot, melodies which the Judge had especially appreciated.

In botany, as in the law and in business, Judge Churchill was accurate and painstaking. With his insistence on self-collected specimens, and his zeal for travel to new places, he was an outstanding amateur. To him, however, there was real joy, as well as intellectual satisfaction, in all the necessary labors of field collector and student. The fields and woods gave him new zest for living, and the study of the plants he found brought him solace as well as happiness.

Hingham, Massachusetts.

New Records for Worcester County, Massachusetts.—On August 21, 1933, at Worcester, I collected *Scirpus sylvaticus* var. *Bissellii;* the second record of the variety for Massachusetts.

Since the seventh edition of Gray's Manual, the variety had been

collected at Bolton, Massachusetts (*F. F. Forbes*) and at Townshend, Vermont (*L. A. Wheeler*).

At Paxton, June 10, 1933, I collected *Carex scorsa;* the first record for Worcester County.

Specimens have been placed in the Gray Herbarium.—EARL W. BEMIS, Worcester, Massachusetts.

NOTES ON THE FLORA OF THE STATE OF WASHINGTON—II

J. WILLIAM THOMPSON

IN the author's first paper[1] a few errors in the description of the new species of *Erigeron Thompsoni* Blake were detected too late to be included in the *Errata* of volume 34. They are:

Page 238, line 24. For descrescentia, read decrescentia.
Page 239, line 3. For 2–6, read 2.6.
Line 4. For 3–8, read 3.8.

This paper is to deal with some new and interesting ranges of plants in this State which have been discovered in the course of exploration during the past two years.

FRITILLARIA CAMTSCHATCENSIS (L.) Ker-Gawler. Hultén[2] has recently given us an interesting account of this plant from its type locality. Abrams[3] assigns it to "moist open woods, Canadian Zone; . . . along the coast to western Oregon." Mr. J. M. Grant gave the author a specimen from the "tide flats near Marysville," which locality seems incredible. Last summer the author found it in a mountain meadow back of the famous Big Four Inn, in the Cascade Mountains of Snohomish County, at about 1000 meters, *Thompson* 8778, which definitely places it in the Canadian Zone in open timber or in cold mountain bogs, in regions covered several feet deep in snow until early summer. There were 2–4 flowers on a stalk, averaging 3.

TRILLIUM PETIOLATUM Pursh. Piper[4] cites collections of this peculiar *Trillium* from Spokane and Pullman, both in the extreme eastern part of Washington. The author has seen it in abundance along Catherine Creek near Union, Oregon. In 1931, while bota-

[1] RHODORA **34**: 236 (1932).
[2] Eric Hultén. Flora of Kamtchatka, **1**: 243 (1927).
[3] Abrams. Ill. Fl. Pac. States, **1**: 423 (1923).
[4] Piper. Flora of Washington, 199 (1906).

nizing near Leavenworth, Chelan County, the author found it along a wooded creek bottom at the eastern base of Tumwater Mountain, *Thompson* 6444, which extended its range westward approximately 200 miles to the central part of the State.

CYPRIPEDIUM PARVIFLORUM Salisb. This widely distributed Lady's Slipper has been found and reported from near Spokane. In 1932, Mr. Chas. B. Fiker of Omak sent the author several specimens, *Fiker* 665, accompanied by the following ominous label which read: "In wet ground, in thickets, among poison ivy and rattlesnakes, protected from stock grazing, in the vicinity of Omak Lake, 15 May 1932." Mr. Fiker later told the author that a big rattler struck his boot while he was collecting this, and "for the sake of peace and safety" he had to kill the snake. The author thinks it is too bad that more of our rare plants do not use this method of protection from "mountain maggots (sheep)" and unscrupulous flower diggers! This station extends the range about 150 miles farther westward.

ISOPYRUM HALLII A. Gray. This interesting member of the Ranunculaceae was originally found along mountain streams in the foothills bordering the Willamette Valley, Oregon. The author has found it there twice: In the wooded gorge below the scenic Silver Creek Falls, Marion County, and at the head waters of Wilson River in Tillamook County. While on a brief trip just south of Elbe, Lewis County, the author found it in abundance along a stream at the foot of Storm King, and *Thompson* 8604 seems to constitute a first record for the State of Washington.

AQUILEGIA VULGARIS L. While making a trip to the northeast corner of Mount Rainier in 1931, the author noticed a peculiar *Aquilegia* growing along the newly made road through the deep firs and miles from the nearest residence. It seemed very plentiful and scattered along the roadside for several miles, and a generous collection of it was made. It proved a baffling case for an isolated botanist, and a specimen was submitted to Dr. Edgar Anderson who reported that it was apparently *A. vulgaris* × *olympica*. This is an interesting find for both its pedigree and its unusual remote location along the new road to Yakima Park, Mount Rainier, near the entrance to the Park boundary, *Thompson* 7209. No other species of *Aquilegia* was found that day.

RANUNCULUS COOLEYAE Vasey & Rose, Contr. U. S. Nat. Herb. **1**: 289, pl. xxii (1893); see colored plate in Harriman Alaska Expedition, vol. I: facing page 254.

The finding of this species on the crest of a mountain peak in the extreme southwestern part of the Olympic Mountains has been one of the biggest surprises of the author's career as a botanist. Never will he forget the hard trip of ten long weary miles of mountain trail which began near sea level and wound up and down and around until it reached the summit of Mount Col. Bob at 4750 feet. The trip began before daylight. It soon began to get foggy and all day the lower wooded slopes reminded one of approaching dusk. When the summit was reached, the sun was shining brightly, but everywhere below was a sea of fog and clouds. To the north the crown of Mount Olympus was thrust up through this sea like a rugged enchanted island. Occasionally a great mass of fog would suddenly detach itself from the mass below and come swishing upward to engulf everything for minutes at a time. With the thoughts ever uppermost in mind of the long ten miles back to camp that night, the author went hastily to work to explore the crest, and in a few minutes had picked up the following rare species: *Polystichum Andersoni*, *Poa stenantha*, *Carex circinata*, *Lloydia serotina*, *Thlaspi glaucum*, var. *pedunculatum*, *Pinguicula vulgaris*, *Synthyris schizantha*, and *Erigeron Coulteri* Porter. The *Lloydia* grows in the crevices of cliffs on the northern side, and while the author was collecting this for the first time, a brilliant yellow buttercup attracted his attention. The snow had melted away from the cliff for about twenty feet. Right against the cliff, the buttercup was passing from flower to fruit, and down toward the snow a few feet away, it gradually diminished in stage of growth until it was just coming up where the snow left the ground bare as it receded away from the cliff.

The author hastily gathered a few specimens in different stages and began a reluctant return towards the distant camp. It did not fit into any of the western floras, and I submitted a specimen to Mr. Lyman Benson who is studying the group for Abrams' Illustrated Flora of the Pacific States. His first impression was that it was new to science, but on thorough investigation, he was surprised to find that it was *Ranunculus Cooleyae* of Alaska—but what a jump in range!

It was originally named for Prof. Grace Cooley of Wellesley College who discovered it while spending a vacation at Juneau, Alaska, in 1891. The next year Gen. Funston found it in the St. Elias Alps above Disenchantment Bay. Dr. Greene, that incomparable splitter,

placed it in the genus *Kumlienia* with another California buttercup; but conservative botanists prefer to let in remain a *Ranunculus*.

The author's collection, *Thompson* 7236, is the first record of this rare buttercup for the United States.

DICENTRA UNIFLORA Kell. This dainty wee bleeding-heart has a wide range but because it is so small and blooms so early, it is seldom found. Mr. Clarence B. Seely, a promising young collector, found it last spring growing on the precipitous slopes of the picturesque Tumwater Canyon near Leavenworth, Chelan County. Prof. Flett and Mr. Suksdorf report collections from Mount Adams. This collection of Mr. Seely's extends the range considerably northward in this State, and at quite a low altitude of less than 250 meters; it is represented in the author's herbarium as *Seely* 132.

SPIRAEA CINERASCENS Piper. (*Luetkea cinerascens* Heller; *Petrophytum cinerascens* Rydb.). This plant was originally found in the crevices of basaltic cliffs now known as Ribbon Cliff near where the road leaves the Columbia River to pass around the south end of Lake Chelan. It was found by Mr. Elmer in 1897, and not since, as far as the author knows. But in 1932, while driving along the cliff road a few miles north of Wenatchee, great patches of this rare Spiraea were found hanging from the bare cliffs. It prefers the shady side of the rocks, but even at that, the sun beats down there in the summer time at a terrific heat of about 130° F. It blooms quite late for such a warm situation, middle of August, and where it gets the moisture to sustain life is a mystery to the author. Its near cousin, *Spiraea Hendersoni*, also grows in the crevices of cliffs, but in a region of dense fogs and winter snows. The collection is *Thompson* 8526.

GEUM RIVALE L. This circumpolar plant has its range given in the North American Flora **22**[5]: 407 as follows: "In swamps and low ground, from Labrador and Newfoundland to New Jersey, Missouri, New Mexico, and British Columbia; also in Europe and Asia." Last summer the author found it growing sparingly in a low alpine meadow between Tonasket and Republic in Okanogan County, *Thompson* 8637, associated with *Petasites sagittata* and *Populus tremuloides*. This is the first record for the State.

ACOMASTYLIS DEPRESSA Greene. The type locality of this plant is Mount Stuart (not Stewart, as in North American Flora **22**[5]: 413), and one of the big thrills of 1931 was to refind this plant several times on various slopes of Mount Stuart. The author was camped on the

western base of the mountain, and when working up the almost perpendicular cliffs, he found a quantity of it growing in the shade of a moist nook at about 6000 feet. Later on in the day it was seen on the dangerous north side in deep shade, and again near the summit where it would have been death to try to reach it. It is a very showy plant when in bloom and reminds one of a cross between a strawberry and a Potentilla. The collection was distributed under the name of *Geum Rossii*, the original collection having been cited by Piper[1] as *Sieversia Rossii*. *Thompson* 7628 is the second known collection.

VIOLA SHELDONI Torr. The type was found at Yuba, California. It is common in Jackson and Josephine Counties, Oregon, and Suksdorf found it in the White Salmon Valley, in this State. The author found it growing under the half prostrate branches of *Purshia tridentata* on a warm yellow-pine slope west of Cle Elum, Kittitas County, and *Thompson* 5949 extends the range many miles farther north.

HACKELIA VENUSTA (Piper) St. John. This handsome Borage was found in the granitic slopes of Tumwater Canyon near Leavenworth by Mr. I. C. Otis. Prof. Piper described it as *Lappula venusta*,[2] but when *Hackelia* was restored, Dr. St. John[3] placed it in the right group. Dr. St. John revisited the locality whence it came, but was unable to find it. The author visited the locality on 21 May 1931, and found what he thought at first was a large Phlox, but which turned out to be the above. A large collection was made and sent to the various herbaria. A few weeks later, the author collected it in fruit, collections being *Thompson* 8266 and 8422, both from the exact type locality. Living plants have been sent to the New York Botanical Garden, where it is hoped that it will flourish and be introduced into cultivation in the near future.

CRYPTANTHA THOMPSONII I. M. Johnston, Contr. Arn. Arboretum **3**: 88 (1932).

This recently described species is one of several recently published, or in process of being published, and is included here perhaps from vanity on the part of the author; but it is quite a thrill to find such distinctive new species. This plant is another one of the several endemics of the Wenatchee Mountains around Mount Stuart, occurring below obsidian cliffs at the head of Beverly Creek, Mount Stuart region, *Thompson* 7663 and 8742.

[1] Piper. Flora of Washington, 344 (1906).
[2] Proc. Biol. Soc. Wash. **37**: 93 (1924).
[3] Research Stud. St. Coll. Wash. **1**: 104 (1929).

ERIGERON LONCHOPHYLLUS Hook. Dr. Blake[1] gives the range of this species as "Saskatchewan to British Columbia, Nevada, and Colorado." Prof. M. E. Peck has found it in Oregon, and last summer the author found it in an open boggy creek bottom near Tonasket, Okanogan County, *Thompson* 8665.

ERIGERON ACRIS L., var. ASTEROIDES (Andrzej.) DC. Dr. Blake gives the range for the species as follows: "Quebec to Alaska, southward to New Brunswick, Michigan, Colorado and Utah." Two widely distant places in this State add it to its flora; base of Mt. Angeles, *Thompson*, 7358 and *Fiker* 1079 from Okanogan County.

CLEVELAND HIGH SCHOOL, SEATTLE.

THE SPORES OF THE GENUS LYCOPODIUM IN THE UNITED STATES AND CANADA[2]

L. R. WILSON

(Plates 275–277)

THE occurrence of certain *Lycopodium* spores as fossils in peat has led to the study of the modern spores of this genus in the United States and Canada. The study has shown that the various *distinct* species have characteristic spore types, which make their identification as fossils possible; also it has suggested the use of spores as another criterion of species and a method of determining phylogenetic relationships.

MATERIALS AND TECHNIQUE

The spores studied were secured from fresh mature specimens of most of the American species of *Lycopodium* as well as from herbarium specimens from various parts of the world. Many slides were made of spores of each species and from these typical examples were chosen. A slight variation in size, shape, and pattern is found among the spores of the same species, but this is due mostly to the age of the spores (maturity and storage), the size of the sporanges from which the spores were taken, and the treatment given in preparing them for study. The smallest sporanges of a strobilus often have what appear to be immature or abnormal spores. Severe treatment will often

[1] Contr. U. S. Nat. Herb. **25** (1925).

[2] Published with aid to RHODORA from the National Academy of Sciences.

collapse the spore or destroy its diagnostic characters so the preparation must be uniformly and carefully made.

It is possible to determine a number of *Lycopodium* species without subjecting the spores to any clearing process, but others (*L. Selago*, *L. lucidulum*, *L. annotinum*, *L. cernuum*, *L. obscurum*, *L. inundatum* and *L. alopecuroides*) have a material on the inside of the walls, which gives the appearance of papillation and must be removed in order that the species be definitely identified. The composition of this removable material has not been determined, but it may be a type of stored food. The following schedule was used in preparing the spores: in a drop of 10% potassium or sodium hydroxide on a slide the spores were boiled for ten seconds, then removed with a scalpel or pipette to distilled water in a watch glass, washed several times by decanting and renewing water, after which they were mounted in glycerine jelly. Stains, such as gentian violet or Sudan 111, may be used, or green, red, and yellow light filters may be used instead to aid in studying the exine features.

The spores were studied under a compound microscope, using a 3 x ocular and a 6mm. objective. The drawings were made with the aid of a camera lucida and show only surface features. The surface upon which the germinating slits are seen is called the apical surface and the basal surface is that opposite. Direct views of both basal and apical surfaces have been drawn and have proved adequate for comparison except in the apical-surface-views of *L. inundatum*, *L. alopecuroides* and *L. carolinianum*. These species have concave apical sides that could not be rendered very satisfactorily; however, the ornamentation has been correctly recorded.

DISCUSSION

By the type and ornamentation of *Lycopodium* spores it is not only possible to distinguish the various species, but also to group the North American forms into sections, which coincide with those that have been made on other morphological structures.

If the American and Canadian species of *Lycopodium* be grouped according to their gross morphological relationships the following three groups will be made: (1) species with a primitive strobilus having unspecialized green sporophylls (*L. Selago* and *L. lucidulum*); (2) species with a slightly to greatly advanced strobilus and slightly to greatly specialized sporophylls (*L. alopecuroides*, *L. inundatum* and

L. carolinianum); and (3) species with a distinct strobilus and highly specialized yellow, scale-like sporophylls (*L. cernuum*, *L. annotinum*, *L. obscurum*, *L. clavatum*, *L. complanatum*, *L. sabinaefolium* and *L. alpinum*). These progressive evolutionary movements have been discussed more fully by Schaffner,[1] and the present findings agree very closely with the line of development described by Dr. Schaffner. There is, however, one minor point of difference found when a study is made of the peduncled strobilus. This will be discussed under group three.

In the first group, composed of *L. Selago* and *L. lucidulum*, the spores are characteristically triangular with concave sides, when observed either on the apical or basal surface (see drawings). The spores of these species differ in size and quality of papillation. Usually *L. Selago* spores are about 5 mu larger in diameter than those of *L. lucidulum;* also, the papillation on the exine of the latter is finer. These spores must be treated as directed above or the material on the inside of the spore wall will appear as papillae masking those on the exine. In *L. Selago* these "false papillae" are usually quite regular while they are not always so in *L. lucidulum*. In an earlier paper[2] describing this group only the "false papillae" were described. With some practice it is possible to distinguish the two species without clearing the spores, but it is advisable to use a uniform technique. The drawings of these two species do not show the "false papillae."

Lycopodium inundatum, *L. alopecuroides*, and *L. carolinianum* compose the second group of Lycopodiums and, like the first, they have characteristic spores. The spores are larger than those of the other species. The germinating slits occur in a furrow that is unornamented. These three species appear to represent an ancient group. The probable antiquity of *L. carolinianum* has been pointed out.[3] *L. alopecuroides*[4] appears to be confined to the Atlantic Coastal Plain and *L. inundatum*, while widespread in boreal regions, is probably a more recent offshoot from the same stock.

Lycopodium carolinianum may be considered by some investigators as belonging to the next group, but though the sporophylls of this

[1] Schaffner, J. H. 1931. *Characteristic Examples of accumulative progressive evolutionary Movements.* Ohio Jour. Sci. **31**: 346–349.

[2] Wilson, L. R. 1932. *The Identity of Lycopodium porophilum.* Rhodora. **34**: 169–172.

[3] Fernald, M. L. Rhodora **33**: 46. 1931.

[4] *Lycopodium alopecuroides* is sometimes treated as a variety of *L. inundatum*, but the spore differences would indicate that they are distinct species.

species are yellow and highly specialized, the strobilus distinct upon a scaly peduncle, and the leaves of the stem of two types, the relationship suggested by the spores, the type of rootstock, and the solitary cone upon a peduncle are here considered more fundamental than those characters which would place the species in the next group.

The spores of The Atlantic Coastal Plain species have been referred to as having a size relationship; also the basal surface is found to be wavy-reticulate. In a fourth species (*L. cernuum*) the same wavy reticulation appears. The spore is not, however, nearly the size of those of the other species, but is the smallest of any belonging to the genus in this country or Canada. It would be assuming too much, so few species of the genus having been studied, to construct a phylogenetic series that might illustrate the relationship of one type of *Lycopodium* species to another. Probably the greatest obstacle is the fact that the genus is of such great age that the species living today may represent the ends of long lines of evolution upon widely divergent branches. It is, however, interesting to note the geographic and spore-type relationship of the Atlantic Coastal Plain species. Here we have an ancient physiographic province with a type of habitat that may be of similar great age, and a flora upon it that suggests antiquity. That the Atlantic Coastal Plain species of *Lycopodium* should show relationship by their spores is of considerable interest.

In the third group there are numerous spore types. In this respect it is unlike the others, for *L. cernuum*, *L. annotinum*, and *L. obscurum* appear to be less closely related to each other than are the species within each of the two previously discussed groups. *L. obscurum* spores are the nearest in type to those of *L. clavatum* and the *L. complanatum* group, but differ from them in having an extremely delicate reticulation on the apical surface and coarser reticulation on the basal surface. In other words they have two distinct types of reticulation, while the others have only one. The two last named forms appear to be related to one another if spore type is a criterion. *Lycopodium clavatum*, however, may be separated from the *L. complanatum* group by its smaller reticulation.

The spores of *L. complanatum*, *L. sabinaefolium*, and *L. alpinum* at first appeared to be distinguishable from one another by diameter and the extent to which the reticulation nears the junction of the germinating slits, but these characters apparently are not constant and one is inclined to go back to the suggestion of Underwood[1] and

[1] Underwood, L. M. 1882. Our Native Ferns and their Allies, ed. 2. pp. 118–119.

consider *L. alpinum* and *L. sabinaefolium* as forms of *L. complanatum*. If we interpret this condition of the spores as evidence for close relationship within the Lycopods, it is possible that in this section of the genus is a group of plants that are either extreme ecological forms or which have evolved only slightly along certain trends. Recent treatments would favor the latter possibility.[1]

Dr. Schaffner[2] considers the presence of a peduncle an advance over the sessile type of strobilus, which in all probability is a correct assumption. However, if the three species, *L. complanatum*, *L. sabinaefolium*, and *L. alpinum*, are studied it will be observed that though they are obviously related in their spores and foliage *L. complanatum* has a stout, scaly peduncle, *L. alpinum* has a leafy branch-like peduncle, and *L. sabinaefolium* is intermediate between the two, having a slender peduncle of varied length and with sparse spreading scales. It appears from this that the structure and length of the peduncle may be variable within a group. This is further emphasized in *L. clavatum* and its varieties, for here there is a range in length of the peduncle from less than two centimeters to more than fifteen. The habitat of the plant appears to have much to do with the length to which the peduncle will grow, for among those plants occurring at high altitudes or in the extreme north will be found these short-peduncled forms.

No distinction could be made between the spores of *L. complanatum*, *L. flabelliforme* and *L. tristachyum*. In Wisconsin these three forms merge into one another and appear to be ecologically controlled. Victorin[3] has suggested hybridization for the origin of many forms in this group, but this has never been demonstrated, and the difficulties which accompany the germinating of *Lycopodium* spores make such experimentation practically impossible.

The following synoptic key is given as a brief review of the spore characters, the order of species being based upon spore relationship and gross morphology, and is subject to revision as other species are studied.

[1] Through the kindness of Professor M. L. Fernald the writer has recently been able to examine many more spores of *Lycopodium alpinum*. Measurements have been made of these and graphed to show size as compared with *L. sabinaefolium* and *L. complanatum*. From this study it appears that the spores of *L. alpinum* are slightly different from the others. The details are being reserved for further study.

[2] Schaffner, J. H. l. c.

[3] Victorin, Frère Marie-. 1925. *Les Lycopodinées du Quebec*. Contrib. du Lab. de Bot. de l'Univ. de Montréal. No. 3. p. 77.

The writer wishes to express his appreciation to Dr. N. C. Fassett for his kindly criticism and interest and to Dr. G. S. Bryan for suggesting a terminology for spore characters.

KEY TO THE SPECIES OF LYCOPODIUM IN THE UNITED STATES AND CANADA

A. Spores distinctly triangular and sides concave when seen on the apical surface; basal surface papillate; sporophylls unspecialized; strobilus primitive; plants gemmiparous; stems procumbent or erect; leaves flattened or appressed, little specialized.....B.

B. Spores 32 mu or more in diameter; papillation of exine uniform, evenly distributed; leaves appressed or spreading, widest below the middle, margins entire; stems erect or slightly procumbent.....*L. Selago.*

B. Spores 30 mu or less in diameter; papillation of exine delicate, often indistinct, sometimes irregular in distribution; leaves spreading, widest above the middle, margins serrate or entire; stems procumbent .....*L. lucidulum.*

A. Spores triangular to round and sides convex when seen on the apical surface; basal surface reticulate; sporophylls slightly to greatly specialized; strobilus specialized; plants not gemmiparous; stems horizontal or erect; leaves flattened, incurved, spreading, appressed, fused, or reduced, little to greatly specialized.....C.

C. Spores 43 mu or more in diameter, the germinating slits in a furrow, reticulation on the basal surface wavy; sporophylls green or yellow, slightly to greatly specialized; strobilus distinct and solitary upon a leafy or scaly peduncle; rootstock superficial, creeping; no erect branches; leaves flat, spreading or incurved...D.

D. Apical surface of spores papillate; sporophylls green and but slightly specialized; peduncle leafy; stem-leaves nearly uniform in size.....E.

E. Apical surface of spores with ridge-like rows of papillae extending to the edge of the unornamented germinating furrow, where the papillae are larger and irregular; sporophylls very slightly broadened at the base.....*L. alopecuroides.*

E. Apical surface of the spores with uniformly distributed papillae except in the unornamented germinating furrow; sporophylls distinctly broadened at the base.....*L. inundatum.*

D. Apical surface of the spores not papillate; sporophylls yellow and greatly specialized; peduncle covered with small scale-like bracts; stem-leaves of two distinct sizes.....*L. carolinianum.*

C. Spores 36 mu or less in diameter, the germinating slits not in a furrow, reticulation on the basal surface angular or wavy; sporophylls yellow and greatly specialized; strobilus distinct, sessile or peduncled, one to several on a peduncle; rootstock subterranean or superficial with erect branches; leaves flat, incurved, appressed, fused, or reduced...F.

F. Diameter of the spores 23 mu or less, reticulation on the basal surface wavy, apical surface unornamented; strobilus sessile; sporophylls small and spinulose; leaves linear and incurved.....*L. cernuum.*

F. Diameter of the spores 28 mu or more, reticulation on the basal surface angular, apical surface unornamented or angular-reticulate; strobilus sessile or pedunculate; sporophylls large, not spinulose; leaves flat, incurved, appressed, or fused . . . G.

G. Spores unornamented on apical surface; strobilus sessile; leaves flat or appressed; rootstock superficial . . . . . *L. annotinum.*

G. Spores with angular reticulation on the apical surface; strobilus sessile or pedunculate; leaves flat, incurved, or fused; rootstock subterranean or superficial . . . H.

H. Reticulation on the apical surface finer than on the basal surface of the spores; leaves flat or incurved; rootstock subterranean; upright branches tree-like . . . . . *L. obscurum.*

H. Reticulation on the apical surface of the spores of the same quality as on the basal surface; strobilus sessile or pedunculate; leaves incurved or fused; rootstock subterranean or superficial; upright branches spreading or tree-like . . . I.

I. Ridges of the reticulation appearing on the equator numbering 35 or more, on the apical surface the reticulation usually extending to the junction of the germinating slits; leaves incurved; rootstock superficial; upright branches two or three times divided but not tree-like . . . . . *L. clavatum.*

I. Ridges of the reticulation appearing on the equator numbering 30 or less, on the apical surface the reticulation usually not extending to the junction of the germinating slits; leaves fused at the bases and reduced; rootstock subterranean or superficial; upright branches usually tree-like . . . . . *L. complanatum* group.

Explanation of Plates 275–277

Plate 275. Spores of *Lycopodium Selago* L., *L. lucidulum* Michx., *L. annotinum* L. and *L. cernuum* L.; figs. at left basal view, at right apical view.

Plate 276. Spores of *L. inundatum* L., *L. alopecuroides* L. and *L. carolinianum* L.; figs. at left basal view, at right apical view.

Plate 277. Spores of *L. obscurum* L., *L. clavatum* L. and *L. complanatum* L.; figs. at left basal view, at right apical view.

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SOME TRANSFERS IN DIGITARIA AND PASPALUM

M. L. Fernald

Digitaria filiformis (L.) Koeler, var. **villosa** (Walt.), comb. nov. *Syntherisma villosum* Walt. Fl. Car. 77 (1788). *D. villosa* (Walt.) Pers. Syn. i. 85 (1805).

I am unable to find clear morphological differences to separate *Digitaria villosa* from *D. filiformis*. The latter occurs farther north in the East, ranging from Alabama to Texas and Mexico, thence pushing north in the interior to Michigan, Illinois and Iowa, and east of the mountains to southern New Hampshire. It is usually, but not always, the lower and more slender of the two, with filiform culms 0.5–9 dm. high, with racemes 1–15 cm. long, the spikelets mostly in 3's and 1.5–2 mm. long. Var. *villosa* is often, but not always, coarser and taller (up to 1.4 m. high), with sheaths often more densely villous, the racemes sometimes more distant (up to 3 cm. apart) and 5–25 cm. long, the groups of spikelets usually more distant, and the individual spikelets 2–2.5 mm. long. None of these characters is sufficiently constant to indicate that the plant is a definite species. It ranges from Florida to Texas, northward to Kansas, Missouri, Illinois and Virginia.

PASPALUM CILIATIFOLIUM Michx., var. **Muhlenbergii** (Nash), comb. nov. *P. pubescens* Muhl. in Willd. Enum. Hort. Berol. 89 (1809). *P. Muhlenbergii* Nash in Britton, Man. 75 (1901). *P. pubescens*, var. *Muhlenbergii* (Nash) House, Bull. N. Y. State Mus. no. 243–244: 39 (1923).

P. CILIATIFOLIUM Michx., var. **stramineum** (Nash), comb. nov. *P. stramïneum* Nash in Britton, Man. 74 (1901).

I fully agree with House, that there is no specific line between *Paspalum Muhlenbergii* and *P. pubescens*. Mrs. Chase's note, published at a later date by House, is to the point: "Mrs. Chase (in lit.) points out that *P. Muhlenbergii* Nash is so closely related to *P. pubescens*, that no combination of characters holds, though extremes look quite different."[1] Weatherby, in 1928, was "quite unable to distinguish between the New England plants determined . . . as *P. pubescens* and *P. Muhlenbergii*. . . . It appears necessary to unite the two under one species; and since *P. pubescens* is by far the earlier name and was (again according to information courteously furnished by Mrs. Chase) correctly interpreted by Nash, it must be used for the resultant group."[2] And in 1929, in her *North American Species of Paspalum*,[3] Mrs. Chase merged the two outright.

Wiegand & Eames had gone ever further, taking up *P. ciliatifolium* Michx. (1803) for the species, to which they reduced outright *P. pubescens* and *P. Muhlenbergii*, saying rightly: "The separation of

[1] House, Bull. N. Y. State Mus. no. 254: 70 (1924).
[2] Weatherby, RHODORA, XXX. 134 (1928).
[3] Chase, Contrib. U. S. Nat. Herb. xxviii. 83 (1929).

species in *Paspalum* and *Panicum* on the basis of degree of pubescence is to be regretted. Fluctuation of pubescence is, at most, of only varietal importance."[1] Although in 1928, in the discussion cited, Weatherby was "not yet prepared to follow them quite so far," I find myself, after struggling to get morphological differences, fully in agreement with Wiegand & Eames, except that I should recognize varietally the more strongly marked geographic trends. I should add *P. stramineum* to the series, as an inland variety showing a common response to semi-arid to arid inland conditions, a development of minute pubescence.

The three variations of *Paspalum ciliatifolium* are separated (somewhat unsatisfactorily) by the following tendencies:

Surfaces of leaf-blades glabrous throughout or between the long trichomes, not puberulent.
Surfaces quite glabrous.....*P. ciliatifolium* (typical).
Surfaces long-pilose or villous.....Var. *Muhlenbergii.*
Surfaces minutely puberulent, otherwise either villous or non-villous.....Var. *stramineum.*

Typical *P. ciliatifolium* occurs in dry or moist open places or in thin woods, from Florida to Texas, extending north to New Jersey, Tennessee, Missouri and Kansas. It is also in the West Indies and Central America. Var. *Muhlenbergii* extends farther north, to southern New Hampshire, southern Vermont, New York, Ohio, southern Michigan and southern Wisconsin. Var. *stramineum* is a plant of sandy soils in Texas, New Mexico and Arizona, extending north to Indiana, Wisconsin, Minnesota, Nebraska and Colorado.

That the three lack what some of us would consider fundamental specific differences becomes clear on comparing the descriptions of them and the beautiful illustrations of them in Mrs. Chase's monograph: *P. ciliatifolium* with "spikelets 1.9 to 2.1 mm. long, . . . minutely pubescent"; *P. pubescens* with them "1.7 to 2.1 mm. long, . . . glabrous, . . . rarely sparsely pubescent"; *P. stramineum* with them "2.1 to 2.2 mm. long, . . . sparsely to rather densely pubescent or sometimes glabrous." However, although *P. ciliatifolium* differs from *P. pubescens* in having spikelets "1.9 to 2.1," instead of "1.7 to 2.1 mm. long," "there are a number of specimens, otherwise typical or fairly typical *P. ciliatifolium*, in which the spikelets are only 1.7 to 1.9 mm. long."

As to pubescence, *P. ciliatifolium* is described with the "blades

[1] Wiegand & Eames, Fl. Cayuga L. Basin, 83 (1926).

. . . typically strongly ciliate . . . , but sometimes ciliate toward the base only, very rarely not at all ciliate, otherwise glabrous or pilose along the mid nerve below or minutely pubescent toward the apex, rarely throughout" and in some "the foliage is sparsely pubescent, approaching the less pubescent specimens of *P. pubescens*"; *P. pubescens* itself is defined with "blades . . . from sparsely to conspicuously pilose on both surfaces, sometimes minutely puberulent beneath the long hairs on the upper surface" but "This species varies in the amount of pubescence. . . . The following specimens [with an enumeration] have foliage less pubescent . . . , approaching the sparsely pubescent plants of *P. ciliatifolium*"; and *P. stramineum* is assigned "blades . . . puberulent on both surfaces, rarely obscurely so, and sparsely pilose as well, or the lower surface nearly or quite glabrous except for a few long hairs mostly along the mid nerve, the margins commonly papillose-ciliate."

When *P. pubescens* with spikelets 2.1 mm. long and "sparsely pilose" and with blades "less pubescent" is compared with *P. ciliatifolium* with spikelets 2.1 mm. long, "minutely pubescent" and with blades "sparsely pubescent" what is the SPECIFIC difference? When *P. stramineum* with spikelets 2.1 mm. long, "sparsely pubescent or sometimes glabrous" and with "blades . . . nearly or quite glabrous" is compared with *P. ciliatifolium* with "spikelets . . . 2.1 mm. long . . . minutely pubescent" and with blades glabrous where shall we look for SPECIFIC characters?

The situation in *Paspalum ciliatifolium* is rather closely parallel to that in other species: *P. laeve* Michx., with essentially glabrous sheaths and blades, passing to var. *pilosum* Scribn. (*P. plenipilum* Nash), with them strongly pilose, and by numerous transitions to var. *circulare* (Nash) Stone (*P. circulare* Nash), with more rounded and slightly larger spikelets; *P. pubiflorum* Rupr., with spikelets pubescent, passing into var. *glabrum* Vasey (*P. laeviglume* Scribn.), with them glabrous; *P. floridanum* Michx., with pubescent foliage, var. *glabratum* Engelm. glabrous or nearly so, glaucous and with racemes often longer. Parallel situations in *Panicum* are very numerous.

RANGE EXTENSION IN MISSOURI FOR OPHIOGLOSSUM VULGATUM.—In Missouri, as in many other states, *Ophioglossum vulgatum* is a rarity. Hitherto, this fern has been known in Missouri only from a

few of the lowland counties in the extreme southeastern portion of the state, namely, Bollinger, Stoddard, and Butler counties.

In the spring of 1933 the writer visited a region west of Foley, Lincoln Co., north of the Missouri River. This region is of exceptional botanical interest because of the occurrence here of a number of typical Ozarkian plants, ordinarily confined to the Ozark region south of or bordering the Missouri River, which reach their present known northeastern limit in the state.[1] In fact, this area is really a northeastern extension of the Ozarks both botanically and geographically. Sandy Creek, emptying only a few miles away into the Mississippi River, has eroded in this area a long and narrow ravine bordered by bluffs of the St. Peter sandstone of Ordovician age. The valley of the ravine harbours a varied and luxuriant growth of trees and shrubs, and bordering the banks of Sandy Creek occur numerous species common to alluvial soils and low ground, such as *Senecio glabellus*, which is here near its northern limit in the state. In these rich shaded woods along the stream in the floor of the sandstone ravine the writer discovered three plants of *Ophioglossum vulgatum*, of which two bore fertile sporophylls.

The discovery of this species in Lincoln Co. is an extension northward of approximately 150 miles over its previously known distribution in the state.—Julian A. Steyermark, Missouri Botanical Garden, St. Louis.

THE NAME OF THE AMERICAN LOTUS

M. L. Fernald

Nelumbo **pentapetala** (Walt.), comb. nov. *Nymphaea pentapetala* Walt. Fl. Carol. 155 (1788). *Nymph. Nelumbo* Walt. l. c., not L. (1753). *Nelumbium luteum* Willd. Sp. ii. 1259 (1799). *Nelumbium pentapetalum* (Walt.) Willd. l. c. (1799). *Nelumbo lutea* (Willd.) Pers. Syn. i. 92 (1805). *Cyamus flavicomus* Salisb. in Kon. & Sims, Ann. Bot. ii. 75 (1805). *C. pentapetalus* (Walt.) Pursh, Fl. Am. Sept. ii. 398 (1814). *C. luteus* (Willd.) Nutt. Gen. ii. 25 (1818).

Walter thought that he had specimens of two species: one, which he called *Nymphaea Nelumbo* (misidentified with the Old World species), was described

> foliis peltatis undique integris, calyce quadrifido, corolla multiplici alba, loculis monospermis;

the other, differing only in number of sepals and petals, his new *Nymphaea pentapetala*, was similarly described

[1] Steyermark, J. A. *Notes on Missouri Plants.* Rhodora 35: 283–291. 1933.

foliis peltatis undique integris, calyce pentaphyllo, corolla magna pentapetala alba, loculis pericarpii monospermis.

The number of sepals varies in our American Lotus, being either 4 or 5; the number of petals (5) would be unusual for our plant. Its petals readily fall, however, and some herbarium-specimens have lost some or all of them. Furthermore, certain sheets of specimens show but few petals (*MacDaniels*, from Lake Erie, with 10; *Lindheimer*, no. 662, from Comanche Spring, with only 6); and, in transferring Walter's *Nymphaea pentapetala* to *Cyamus*, Pursh said: "A specimen seen in the collection of a gentleman in Carolina ascertains the existence of this formerly doubtful plant." Since we know only a single indigenous species of *Nelumbo* in Atlantic North America, it is probable that Walter had an unusual or a somewhat disintegrated flower. The identity of his two descriptions is otherwise apparent, even to "corolla alba" for both. I am told by those more familiar than I with the plant growing that the flowers are white, sometimes passing to a weak whitish yellow, so that Walter's description of the color was as accurate as that implied in Willdenow's name *Nelumbium luteum*. Walter, however, was not always precise in his descriptions of color. Dr. S. F. Blake calls my attention to Walter's original description of his *Smyrnium cordatum*, "floribus albis," for a plant which is the type of *Zizia cordata* (Walt.) DC., a species of the small genus known as "Golden Alexanders" because of the brilliant orange-yellow flowers.

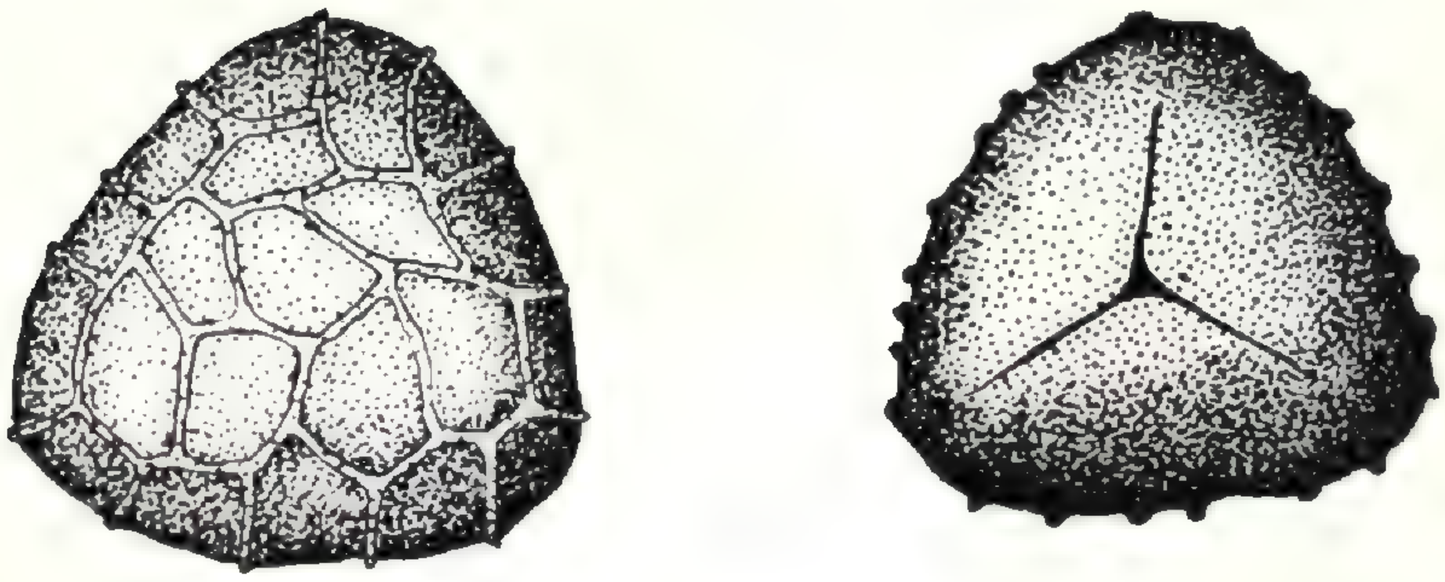
Since, however, Walter's inappropriate name for our Water Lotus antedates by 11 years the more appropriate one of Willdenow and since we are allowed no choice in the matter, but must retain the first, even though inappropriate, the name *Nelumbo pentapetala* must join the long list of often misleading but nomenclaturally correct names.[1]

[1] A long list, in our own flora containing, among others, such cases as *Phyllodoce coerulea* for a shrub with crimson or purple flowers; *Dirca palustris* for a shrub of rich, often dry, upland deciduous woods; *Aster nemoralis* for a characteristic species of open sphagnous bogs, inundated pond-margins and peaty barrens; *Solidago nemoralis* for a plant of sun-baked, open habitats; *Oenothera fruticosa* for a short-lived herb; *Ceanothus ovatus* for a shrub with elliptic-lanceolate leaves; *Gentiana quinquefolia* for one of the leaflest of species; *Lycopus uniflorus* for a plant with several whorls of closely crowded flowers; *Benzoin aestivale* for a shrub flowering in March and April; *Rhus Vernix* for a species which is not the lacquer tree; *Berberis canadensis* and *Ligusticum canadense* for plants unknown within hundreds of miles of southernmost Canada; *Lilaeopsis chinensis*, *Conioselinum chinense* and *Asclepias syriaca* for species endemic in Atlantic North America!

Volume 35, no. 420, including pages 387 to 425 and title-page of the volume, was issued 7 December, 1933.

L. Selago L.

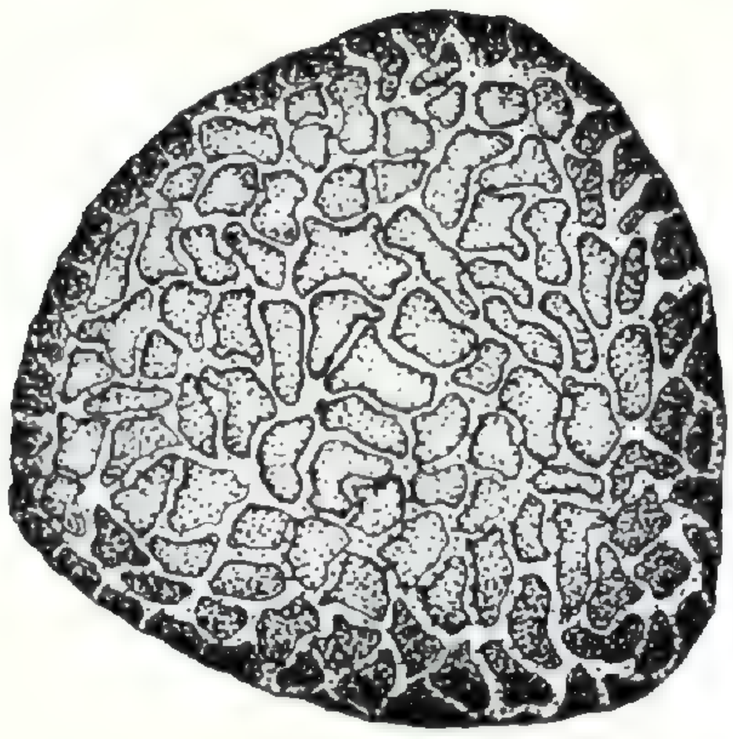
L. lucidulum Michx.

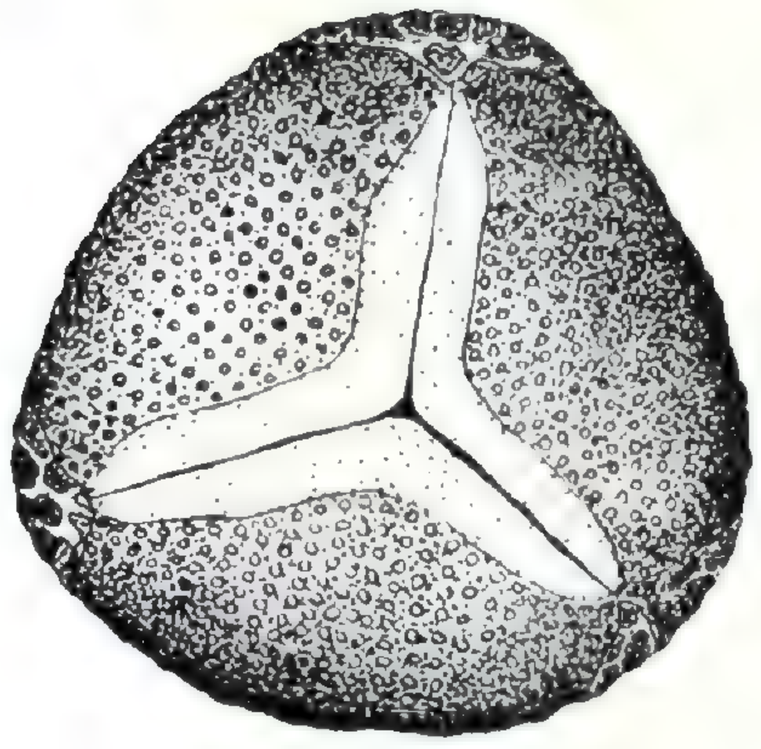


L. annotinum L.

L. cernuum L.

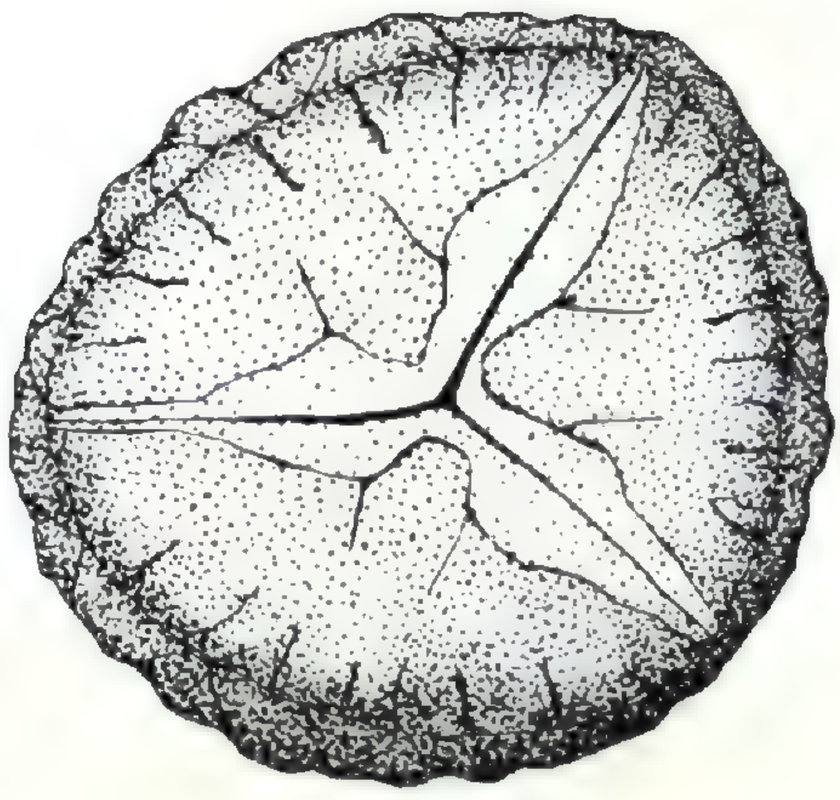
Spores of Lycopodium





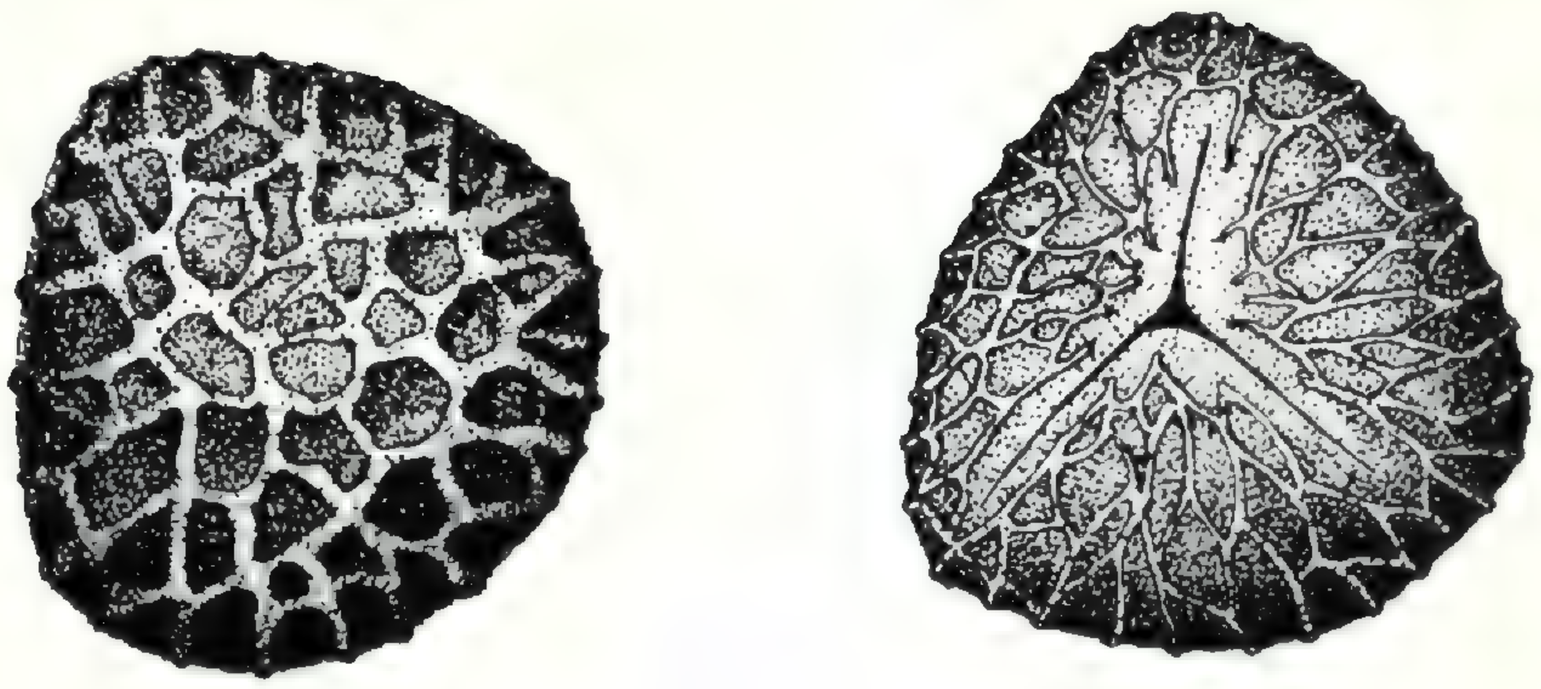
L. inundatum L.

L. alopecuroides L.

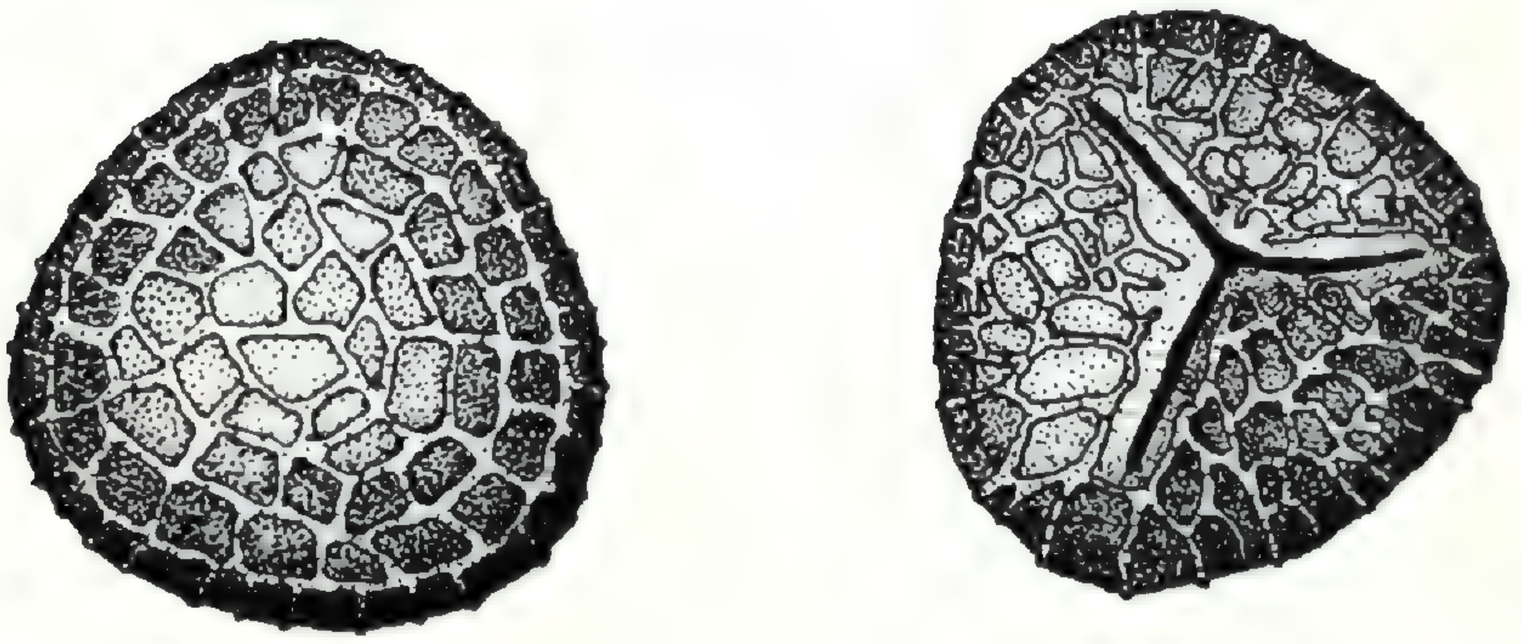


L. carolinianum L.

Spores of Lycopodium



L. obscurum L.



L. clavatum L.

L. complanatum L.

Spores of Lycopodium

6 - 1934

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

MERRITT LYNDON FERNALD, Editor-in-Chief

JAMES FEANKLIN COLLINS
CHARLES ALFRED WEATHERBY } Associate Editors
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Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. February, 1934. No. 422.

THE POLLINATION OF KALMIA ANGUSTIFOLIA[1]

JOHN H. LOVELL AND HARVEY B. LOVELL

THE explosive mechanism of *Kalmia latifolia* L. was described by Conrad Sprengel in 1793, but he supposed that it was designed to secure self-pollination. In 1863 Hasskarl[2] likewise was of the opinion that self-pollination occurs spontaneously in this species. The floral mechanism of *K. angustifolia* L. was discussed briefly by Rothrock[3] in 1867, who observed that the release of the stamens by insects not only threw pollen on the stigma of the same flower, but also upon the stigmas of adjacent flowers.

W. J. Beal[4] seems to have been the first to observe and describe the manner in which the flowers of *Kalmia* are cross-pollinated by insects. He observed the honey-bee and "other Hymenoptera" spring the stamens and become showered with pollen. Flowers covered with netting to exclude insects usually withered without the anthers being set free.

None of the above writers collected or identified the insects which visit either species of *Kalmia*, and in many other respects their observations are either incomplete or inaccurate. In particular the smaller and more northern sheep laurel (*K. angustifolia* L.) has been studied very little. At Waldoboro, Maine, the sheep laurel is very abundant in many neglected pastures, where it is associated with

[1] Published with aid to RHODORA from the National Academy of Sciences.

[2] Hasskarl, J. C. 1863. Über Kalmia latifolia. Bot. Zeit. Leipzig. **21**: 237–239.

[3] Rothrock, J. T. 1867. The fertilization of flowering plants. Am. Natur. **1**: 64–72. This account contains several errors.

[4] Beal, W. J. 1867. Agency of insects in fertilizing plants. Am. Natur. **1**: 254–260.

the earlier blooming rhodora (*Rhododendron canadense*).[4] Farmers often confuse the two shrubs and believe that a single bush bears both kinds of flowers.

The umbel-like corymbs of numerous red flowers of *K. angustifolia* are borne on the shoots of the previous season. The corolla is saucer-shaped, about 12 mm. broad, with a very short tube. There is no noticeable odor. The upper flowers of a corymb may be imperfectly developed, the corolla being white, with no pouches, and the stamens and pistil standing erect and of equal length.

At the beginning of anthesis a small opening appears at the end of the flower-bud, through which the style protrudes for about 3 mm. The capitate stigma is in a receptive condition, and at this stage

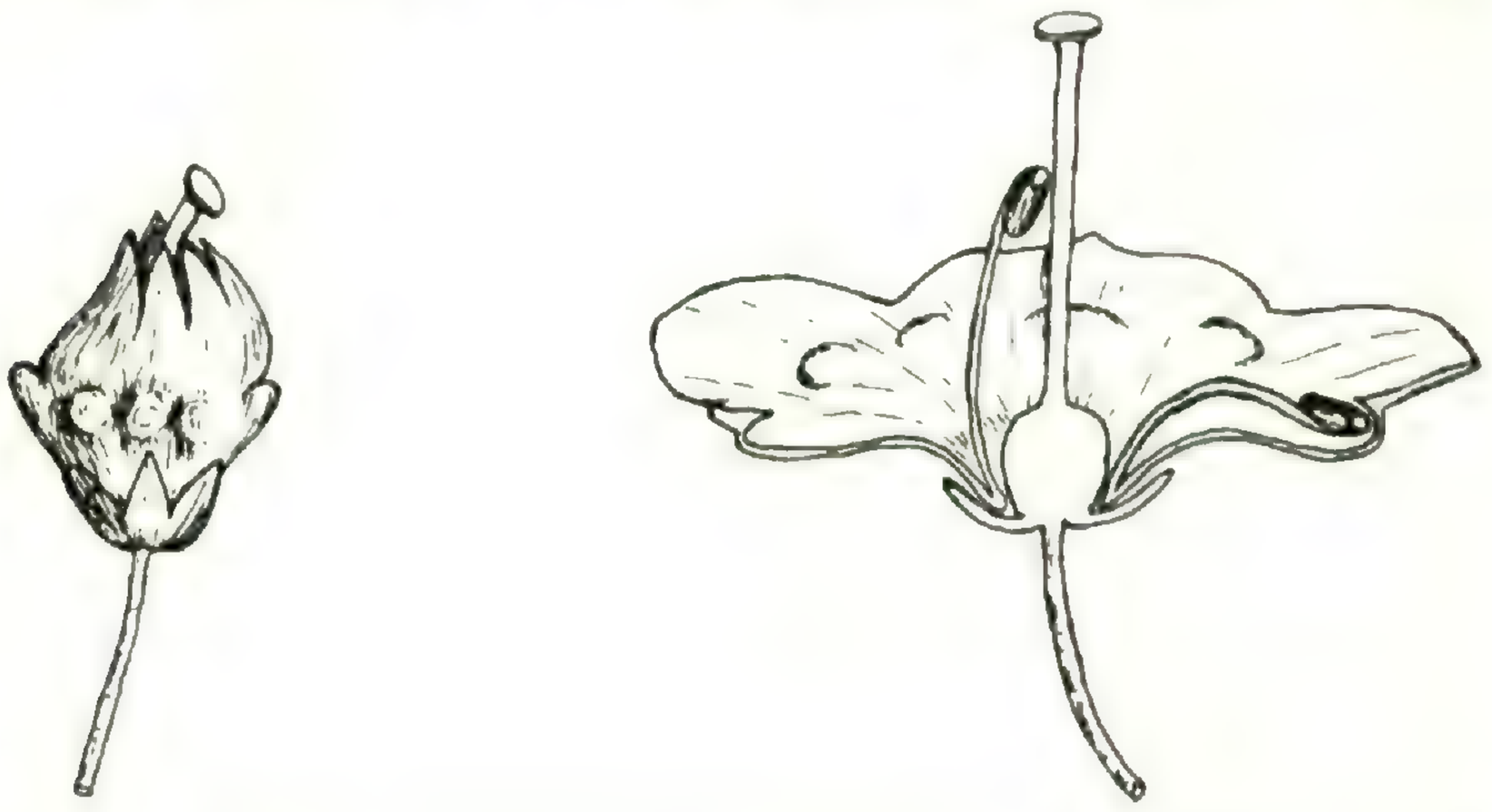

Fig. 1. Bud and expanded flower of Kalmia angustifolia, × 4.

only cross-pollination is possible. Bees were frequently observed visiting the flowers for nectar at this stage.

The pollen is not discharged until the flower is fully expanded. The ten dark purple anthers are held in ten pouches in the corolla-limb, so formed that they prevent the anthers from springing out prematurely. The filaments are white, flat, and strongly bowed upward, in a state of elastic tension. Many flower clusters, while still in bud, were placed in water, where insects could not have access to them, and kept under observation daily. Since none of the stamens became free, it is evident that the anthers can not release themselves spontaneously.

In the field we have frequently seen the stamens sprung by *Bombus ternarius* and *Andrena vicina*, and more rarely by such small bees as

[4] Lovell, J. H. and H. B. Lovell. Pollination of Rhodora. Rhodora, **34**: 213–214.

Andrena claytoniae. A large bee when alighting on the flower first touches the projecting stigma with the ventral part of its body, and as it inserts its proboscis between the filaments and the corolla tube to gather nectar, its legs set free the stamens and a cloud of pollen is thrown over its body. Upon microscopic examination the hairs on the ventral side of the body of such bees were found loaded with pollen. The hairs on the base of the filaments may cling to the legs of the insects and aid in releasing the anthers. When a filament is touched with a needle, the anthers spring upward, scattering a little cloud of white pollen from two large pores at the apex of the anther. The stamens then stand erect for two or three hours, with their anthers in contact with the style, about three millimeters below the stigma, after which the filaments bend backward and the anthers again rest on the corolla.

The light, dry pollen may be carried by a gentle breeze a distance of a foot or more to other flower clusters, so that cross-pollination by the aid of the wind may occur as in Erica and Calluna. Autogamy is not probable, but it is not excluded.

Nectar is secreted sparingly between the base of the filament and the corolla tube. In a great number of flowers no trace of it could be discovered, but in a few flowers it was moderately abundant. This accounts for the comparatively small number of insect visits received by the bloom. Only 12 to 18 insects were usually captured during two hours of collecting. Though an apiary was located only a third of a mile away, not a single honey-bee was seen visiting the bloom, but in the same pasture many of them were gathering nectar from white clover. On the base of the corolla there are a dozen or more dark red triangular spots which possibly may serve as honey guides.

Insect visits to the sheep laurel are so rare that a few observations might easily lead to the conclusion that they are not numerous enough to effect pollination. Not a single species of Diptera was captured, and there were only a few visits by butterflies. Diurnal clear-winged hawk-moths were seen to probe the flowers occasionally, but since they do not alight are probably of no assistance in pollination.

The most common visitor is *Bombus ternarius*, and on a day following a heavy rain they were so abundant that most of the fully expanded flowers were found to have had their stamens sprung. *Andrena vicina* was also a very common visitor. Long continued ob-

servations show that the inflorescence of *Kalmia angustifolia* is effectively cross-pollinated by bees.

The following visitors were taken on the flowers from June 21 to July 12 at Waldoboro, Maine.

APOIDEA: BOMBUS TERNARIUS Say ♀ ☿; B. TERRICOLA Kirby ☿; B. VAGANS Sm. ☿; PSITHYRUS ASHTONI Cr. ♀; ANDRENA VICINA Sm. ♀; A. CLAYTONIAE Rob. ♀; A. SP. ♀; AUGOCHLORA CONFUSA Rob. ♀; NOMADA FLORILEGUS Lovell & Ckll. ♀; CILISSA AMERICANA Sm. ♀; COLLETES MESOCOMUS Swenck ♀ ♂ (This bee has been found only on this flower and at Waldoboro).

LEPIDOPTERA—Butterflies: ARGYNNIS APHRODITE Fab.; COLIAS PHILODICE Godt.; MELITAEA NYCTEIS Doubl. Moths: A clear-winged hawk-moth (not captured), probably HEMARIS DIFFINIS.

COLEOPTERA—CERAMBYCIDAE: LEPTURA CHRYSOCOMA Kirby.

WALDOBORO, MAINE.

NOTES ON THE SPRING FLORA OF THE COASTAL PLAIN OF SOUTH CAROLINA NORTH OF GEORGETOWN[1]

C. A. WEATHERBY AND LUDLOW GRISCOM[2]

ATTRACTED by the glowing reports of a friend of the wealth of bird and plant life in the vicinity of Myrtle Beach, Horry Co., South Carolina, the junior author took a cottage there, and spent a month's vacation from April 4 to May 2, 1932. The senior author motored south via Wilmington, North Carolina, arrived at Myrtle Beach April 17th, and left on April 23rd for Charleston, collecting a few plants northeast of Georgetown en route, and examining a portion of the Elliott Herbarium at the Charleston Museum. On his return north he swung inland through Columbia, and collected a few additional species, not found near Myrtle Beach, on the inner edge of the coastal plain, chiefly in Lexington Co.; and a few more on the outer edge of the Piedmont in Saluda Co. These are listed in a separate section beyond. The junior author spent practically all day every day afield.

The area chiefly investigated, however, was a narrow strip along the coast from the North Carolina line at Little River to the estuary at Georgetown, formed by the confluence of the Waccamaw, the Pee Dee and the Black Rivers. The limit inland was Conway on the Waccamaw River.

The chief excuse for this paper is that no literature in existence

[1] Published with aid to RHODORA from the National Academy of Sciences.

[2] In type long prior to the publication of Small's Manual of the Southeastern Flora, and only partially revised to date.

can give the prospective visitor to this little explored area any adequate idea of what he may expect to find and what he should look for. The works of those great early explorers Walter (according to Coker, chiefly the upper part of Berkeley Co.) and Elliott (chiefly nearer Charleston) are useful mainly in supplying a list of specialties, first class modern topotypical specimens of which are badly needed in practically all the herbaria of the country. Ravenel, for years the director of the historic Charleston Museum, published an unannotated and admittedly incomplete check-list of the plants of South Carolina in 1882, but scarcely any one living could translate this list correctly in terms of the modern segregates as now understood, and it would still be anybody's guess as to how many of them would occur along the coastal strip north of Georgetown. There is no evidence that Ravenel himself ever explored north of the Santee Canal just below Georgetown.

Porcher's "Catalogue of Phaenogamous Plants and Ferns of St. John's, Berkeley Co.," though worked out with unusual care for its time, was published in 1847. Coker's "Plant Life of Hartsville, Darlington County," 1912, though modern in nomenclature, thorough in most respects, and useful in distinguishing habitats, does not give times of flowering and, covering a small region only, is far from giving a comprehensive idea of the flora of the Coastal Plain.

The most serviceable paper for our purposes proved to be the second edition of the flora of Wilmington, North Carolina (a region floristically similar), published in 1886 by T. F. Wood and Gerald McCarthy. The junior author copied from this list all the more southern herbaceous species recorded as blooming before May 1. It is an interesting commentary on our state of knowledge that, of the plants actually collected by us in South Carolina, less than 50% could have been expected on the basis of this list.

For these reasons little attempt has been made in the systematic portion of the paper beyond to indicate the species previously unrecorded from the State. In most cases their occurrence could be inferred as a matter of common sense. In other cases we find old and fragmentary specimens in the Gray Herbarium from South Carolina, though we are not aware of any definite published record, and often they were originally distributed under some other name. In the present state of our knowledge, therefore, whether or not a given species has been definitely recorded from the State has no significance

unless a genuine range extension is involved or unless we are dealing with so rare and little known a plant that any additional collection deserves emphasis. We have endeavored to call attention to such cases.

The outstanding feature of interest about the coastal plain of northern South Carolina is the extensive areas of a striking white sand pine barren, a formation which contains many peculiar and local species, some of them endemic. This type of soil is best known botanically around Wilmington, North Carolina, but extends southward to the Santee River in the form of a series of discontinuous islands, which contain both wet and dry areas. The famous Venus'

Photograph by Mary R. Walcott

FIG. 1. South Island, Georgetown, showing SABAL PALMETTO.

Fly-Trap (*Dionaea muscipula*) is probably the best known plant confined to these areas in wet portions, and *Lupinus villosus* and *Robinia nana* are striking species characteristic of the particularly dry areas of pure white sand.

An important topographic feature in the South is the character of the coast line. Where the coast consists of a series of sounds or bays with a fringe of outer islands and beaches, plants of a southern type tend to extend northward on these outer islands, which have a slightly more moderate winter climate. Thus the cabbage palm (*Sabal Palmetto*), so characteristic of the outer islands around Charleston, was growing luxuriantly on South Island, east of Georgetown

and on the south side of the estuary, but only three stunted trees were seen on the southern tip of North Island. Nestled in the hollows of the dunes on Pawley's Island, about half way between Georgetown and Myrtle Beach, we found the striking shrub, *Osmanthus americana*, which is apparently absent on the straight coast north of this point, but reappears on the outer islands of the North Carolina coast. Similarly, the saw palmetto, *Serenoa serrulata*, occurs on the islands in Back Bay, Virginia, but is unknown on the mainland.

A few words can be devoted to the main habitats of the region and their more characteristic plants. The outer beaches can be dismissed with a brief mention, as they furnish practically no spring-flowering species. The striking sand-binding grass is *Uniola paniculata*, the dried panicles of which persist over the winter. *Myrica cerifera* was, of course, ubiquitous, varied with stunted clumps of *Ilex vomitoria*. Here and there patches of *Xanthoxylum Clava-Herculis* offered a formidable barrier to further progress. It was in bud, but never actually in bloom during our visit.

As a general statement the country might be described as open sandy pine woods, with or without an admixture of deciduous trees. Here and there were stretches of open pine lands normally wet, with many characteristic plants. Every mile or so along the coast was a depression with running water, the drainage in the majority of cases into ponds just back of the ocean. These depressions were locally called swashes, draws or bottoms, and contained a much richer soil, with a richer and more varied woodland and dense thickets and tangles. These bottoms and the wet pine lands provided the only showy displays of herbaceous plants in bloom.

They furnished, however, an interesting reversal of the normal situation in the coastal plain of New Jersey and Massachusetts in that one *ascends* out of the richer draws to the white sand barrens above. It is apparent, therefore, that this special white sand formation is deposited upon and overlaps a more generally distributed type of soil below, which is exposed here and there by water action or some other agency.

The other remarkable feature of these draws was the mingling of characteristic Austroriparian types with plants which we should regard as characteristic of the Piedmont belt farther inland, or of the north. Along the water courses, *Cardamine bulbosa* grew with *Stellaria uniflora* and clumps of *Ranunculus palmatus*, shaded by *Ben-*

zoin aestivale. Patches of Bloodroot and *Pedicularis canadensis* grew side by side with the showy *Zephyranthes*, shaded by thickets of southern species of *Ilex* and *Smilax*. It is difficult to account for the presence of these plants in a region the drainage of which is *not from* the Piedmont Belt, and separated from it by the Austroriparian cypress swamps of the Waccamaw River.

In the mixed pine and deciduous woods the spring display was afforded by shrubs and trees. Flowering dogwood was in full bloom the middle of April, preceded by the Plums (*Prunus umbellata* and *angustifolia*). The lovely little Azalea (*Rhododendron atlanticum*) was generally distributed, its pink flowers resembling those of the northern *nudiflorum* and, like them, appearing before the leaves. *Magnolia virginiana*, an occasional bush of *Vaccinium virgatum*, and *Lyonia nitida* were conspicuous a little later. The only dominant violet was *Viola septemloba*. The chief *Carex* was *C. nigromarginata*. The chief grasses were *Melica mutica* and *Stipa avenacea*, which were just being replaced by *Danthonia sericea* at the end of the month.

In the pure stands of dry pine woods at a slightly higher elevation the flora was much more restricted. The chokeberry (*Pyrus arbutifolia*) was the only dominant shrub in bloom early in the month. All three lupines occurred rarely and locally in colonies, and a curious prickly little Euphorbiaceous species (*Cnidoscolus stimulosus*) was occasional to frequent the last week in April.

Six to ten miles north of Myrtle Beach there was a remarkable area of white sand barrens that looked for all the world like a patch of desert. No pine grew here, but a gnarled and stunted oak in open stands. The species was indeterminable, as the tree was far behind the other kinds, and did not bloom or develop leaves during our stay. There was an occasional small tree of *Vaccinium arboreum*. The curious *Ceratiola* grew only in this habitat. Underfoot there was practically no herbaceous vegetation of any kind. An occasional shrub of the dwarfed *Vaccinium virgatum* var. *tenellum* with either pink or whitish flowers, and a very few patches of the little *Robinia nana* with lovely flame-pink flowers provided a little color. There was an occasional plant of the decumbent *Asclepias humistrata* in bud, at this season chiefly reddish with no green chlorophyll apparent, and patches of a little pink-flowered *Tradescantia* just coming into bloom. But for the most part as one looked around, there was nothing but a waste of white sand under the stunted trees. We

should like to follow the seasons through in this most striking and peculiar habitat.

In two respects we were unfortunate in the season. There had been no winter at all in South Carolina, and the spring vegetation had started abnormally early. A severe cold wave in mid-March drove the temperature down to 14° and killed most of the vegetation, and it then remained abnormally cool until the end of April. The natives declared the spring to be about two weeks late the first week in April and certainly the bird migration was abnormally late and disrupted.

A worse handicap was, however, the severe drouth; the country was dried up. The wet pine lands were mostly baked as hard as iron, in addition to being ditched, and the only plants to come up in places were on the edges of these drainage ditches. Undoubtedly the floral display in these wet pine lands was greatly reduced both in quantity and variety by these two factors combined. Moreover severe and destructive forest fires raged throughout the country, and some of the area will not return to normal for many years, if ever again. On April 7th the junior author was forced to suspend botanizing after lunch, as the town of Myrtle Beach was threatened with destruction. For five hours every able-bodied adult worked with desperation to prevent the fire from jumping from the woods to the beach. Three times the fire, borne on a strong west wind, advanced through the woods in a column of flame 50 feet high and made a spectacular jump of 150 yards to the boardwalk, setting it and adjacent houses on fire. A week later the junior author made a first attempt to visit the marshes around Georgetown Landing. Several square miles were on fire here simultaneously, and making a turn in the woods we were startled to see a column of fire 8 feet high coming rapidly down the road to meet us. The car was turned around with barely a second to spare. In this particular fire 18 square miles were affected, and the botanizing was of course destroyed.

The compensation was the relative accessibility of the cypress swamps, which ordinarily would have been 3–5 ft. under water. The Waccamaw River, instead of a raging torrent, was a placid stream on which we often went boating. We admired the stately cypress, the giant gums and other trees, and the floating patches of *Nymphozanthus sagittaefolius*. The banks of the river were overhung with *Styrax americana* and *Leucothoe racemosa* with extraordinarily elongated racemes. Here and there the scarlet berries of *Smilax Walteri* gleamed

among the delicate greens, but the common *Smilax* was *S. laurifolia* with its persistent green berries and tough leathery leaves. The only flowers along the river banks that were not white were *Wisteria frutescens* and *Bignonia capreolata*. In the depths of the swamp there was little at this season but species of *Carex* just coming into condition and where there was a little sunlight a clump of Iris. None of the trees were in condition to collect.

Even less can be said of the great marshes in the estuary of the Waccamaw River, with their abandoned rice fields. August and September would be the proper months to botanize these marshes. The cane brakes (*Arundinaria*) were varied with cat-tail marshes, but the dominant plant was *Zizaniopsis miliacea*. The Golden Club (*Orontium*) was practically the only aquatic in bloom.

In the list which follows, stations not otherwise placed are in Horry County. The single exception is Georgetown, which may be assumed to be in the county named for it.

It will be observed that two series of numbers have been used. For convenience, the junior author's numbers have been applied to all specimens collected by him or by us both; the senior author's numbers have been used for all collected by him after leaving Myrtle Beach.

The first set of our collection is deposited in the Gray Herbarium. Duplicate sets have been sent to the New York Botanical Garden, the U. S. National Herbarium and the University of Pennsylvania. A set of the woody plants is in the herbarium of the Arnold Arboretum and a selected set of all groups, containing some unicates, in the herbarium of the junior author.

Botrychium dissectum Spreng., var. obliquum (Muhl.) Clute. Dry open deciduous woods, near Myrtle Beach, no. 16,394.

Plants all sterile, variable in leaf form, some individuals with oblong-ovate and obtuse, others with linear-oblong and acute, segments. The former condition has passed as *f. oneidense* (Gilbert) Clute, the latter as *f. elongatum* (Gilbert & Haberer) Weatherby.

Pinus palustris Mill. Frequent in white sand, often forming pure stands. The young seedlings, with their very long needles proceeding from the ground level, resemble basal rosettes of a *Xerophyllum*. Our specimen from near Myrtle Beach, no. 16,398.

Pinus serotina Michx. On normally wet barrens where such herbaceous plants as *Pinguicula* and *Sarracenia flava* flourish; less

common than the preceding. Our specimen from near Burgess P. O., no. 16,397.

PINUS TAEDA L. Frequent in sand: our specimen from near Myrtle Beach, no. 16,399.

TAXODIUM DISTICHUM (L.) L. C. Rich. Dominant in all swamps of the region; our specimen from marshes along the estuary of the Waccamaw River, Georgetown Landing, no. 16,396.

SAGITTARIA LANCIFOLIA L. Wet places, frequent; our specimen from marshes along the Waccamaw River, Longwood Landing, no. 16,395.

PANICUM YADKINENSE Ashe (det. Hitchcock). Alluvial woods along Waccamaw River opposite Sandy Island, no. 16,412.

PANICUM LANCEARIUM Trin. (det. Hitchcock). Sandy roadside ditch, 2 miles south of Georgetown, no. 16,418.

PANICUM ROANOKENSE Ashe (det. Hitchcock). Wet pine barrens south of Socastee, no. 16,423.

Not reported from South Carolina in Hitchcock & Chase's Monograph.

PANICUM CHAMAELONCHE Trin. Dry grass-land at edge of golf-links, Myrtle Beach, no. 16,406. Sandy roadside ditch, 2 miles south of Georgetown, no. 16,417.

Not reported from South Carolina in Hitchcock & Chase's Monograph of Panicum. In addition to our collections, there is in the Gray Herbarium a sheet collected near Charleston, *B. L. Robinson*, no. 64, May 4, 1912.

PANICUM LAXIFLORUM Lam. Dry sandy roadsides, 4 miles south of Myrtle Beach, nos. 16,419; 16,420. Alluvial woods along Waccamaw River opposite Sandy Island, no. 16,410.

In no. 16,419 the leaves are quite as ciliate as in much of *P. xalapense*, but the spikelets are even larger than the dimensions given for *P. laxiflorum* (mostly 2.5 mm. long). No. 16,410, growing in shade, is a more slender plant than the others, with leaves 5–7 mm. wide, but in other respects appears the same. The species is not reported north of Georgia by Hitchcock & Chase; it appears to us, however, that *P. xalapense* is doubtfully separable.

PANICUM CONSANGUINEUM Kunth. Wet pine barrens south of Socastee, no. 16,422.

PANICUM COMMUTATUM Schultes. Dry sandy pine woods, 2 miles south of Myrtle Beach, no. 16,421.

PANICUM OLIGOSANTHES Schultes. Dry sandy roadside in pine barrens, 2 miles north of Myrtle Beach, no. 16,416.

PANICUM JOORII Vasey. Dark rich wooded swamp, Longwood Landing, no. 16,403.

Zizaniopsis miliacea (Michx.) Doell & Aschers. Long abandoned rice-fields along Waccamaw River, Georgetown Landing, no. 16,415.

Phalaris caroliniana Walt. Sandy bank of causeway through old rice-fields, Georgetown Landing, no. 16,413.

Stipa avenacea L. Dry pine barrens, 2 miles north of Conway, no. 16,401; south of Myrtle Beach, no. 16,409.

One of the commonest species of barren open woodlands.

Agrostis scabra Willd. (*A. hyemalis* of recent manuals, not Walt. See Fernald, Rhodora **35**: 207 (1933).) Wet pine barrens, one mile south of Little River, no. 16,424.

In the Gray Herbarium there is no material of this species from any point south of Pennsylvania; in view, however, of the scanty representation of the flora of the southeastern states, this extension of the range given by Prof. Fernald is probably not so startling as it appears.

Sphenopholis. Edge of ditch in loose roadside soil, causeway through old rice-fields, Georgetown Landing, no. 16,411.

A puzzling plant, combining characteristics of *S. obtusata* and *S. pallens*,[1] but not satisfactorily referable to either.

Typically, in *S. obtusata*, the first glume is obtuse, the second glume is 1.7–2.3, usually 2, mm. long, as seen in profile cuneate in outline, tapering evenly from the narrow base to the truncate apex where it is widest, and about half as broad as long—that is, when spread out, the glume is as broad as long. The margins are yellowish-white and chartaceous. The lemmas are obtuse and the paleas nearly or quite equal them in length. The spikelets are mostly short-pedicelled and the panicle therefore dense.

In *S. pallens*, the first glume is typically acute. The second is 2.5–3, mostly about 2.5 mm. long, as seen in profile oblanceolate to obovate, acute, widest distinctly below the tip, less than half as broad as long (about 0.5–0.7 mm.),—i. e., longer than broad when spread out—and with a silvery white, hyaline margin. The lemmas are acute and sensibly longer than the paleas. The pedicels of the

[1] Here used in a broad sense to include typical *S. pallens* (*S. aristata* (S. & M.) Heller) in which the upper floret is awned, *S. intermedia* Rydb., and the common plant with awnless lemmas which passes as *S. pallens* in current manuals and is perhaps *Aira pallens mutica* of Muhlenberg's Catalogue. See Scribner, Rhodora **8**: 139 (1906) and Hitchcock, Bartonia **14**: 34 (1932). Scribner's guess that *A. pallens mutica* refers to *S. pallens* of manuals appears to us *a priori* more probable than Hitchcock's that it refers to a specimen of *S. nitida* preserved in a cover of mixed material labelled *A. pallens* in the Muhlenberg herbarium. The cover also contains a specimen of awnless *S. pallens* and Muhlenberg, who distinguished *S. nitida* (as *Aira mollis*) in his Descriptio, would not have been likely to confuse the two.

spikelets tend to be comparatively long, producing a relatively loose panicle.

Both groups vary. Many southern specimens of *S. obtusata* have the second glume proportionally narrower and less truncate than in typical material; and in *S. pallens,* the form described by Rydberg as *S. intermedia* has the second glume only 2 mm. long and broader and more obtuse than in the more usual and typical form. So far as the second glume is concerned, there is little but texture to separate these two extremes. The comparative length of lemma and palea is also variable and *S. pallens* may have nearly as dense a panicle as *S. obtusata.* Our plants are large for the genus, with stout, densely tufted culms 7–8 dm. high,[1] leaves up to 6 mm. wide and nearly 2 dm. long, and densely flowered panicles 14–16 cm. long. In the spikelets, the first glume is acute. The second is 2.5 mm. long, as seen in profile narrowly obovate, distinctly acute, widest below the apex, and 0.7–1 mm. broad (i. e. 1.4–2 mm. when spread out). Although the flowers are young (the stamens not yet exserted) the glumes already show a somewhat chartaceous texture. The lemmas are sharply acute and slightly longer than the paleas; in both florets of a spikelet their mid-nerves are excurrent into a short, straight awn, 1 mm. or less long.

Geographic location, texture of second glume and rather long palea would suggest reference of our plant to *S. obtusata.* But in other characters it leans rather to *S. pallens*, which, to our minds, it most resembles.[2]

In its terminal awns it is unique among the specimens we have seen. This character is of little taxonomic significance in most grasses; it happens, however, to be extremely rare in this section of *Sphenopholis.*

Wherewith, and pending collection of further material, we leave our plant as a *forma inquirenda.*

TRISETUM PENSYLVANICUM (L.) Beauv. Swampy wooded bottom, north of Conway, no. 16,400.

DANTHONIA SERICEA Nutt. Dry pine woods, two miles north of Conway, no. 16,402.

A frequent and handsome grass.

[1] This vegetative vigor may be accounted for by the disturbed soil in which the plants grew.

[2] Similarly, *S. intermedia,* originally described and named as falling between *S. obtusata* and *S. pallens* has most of the essential characters of the latter, differing chiefly in the smaller florets and more obtuse second glume.

Melica mutica Walt. Rich pine woods south of Myrtle Beach, no. 16,408. Occasional, often in large colonies.

Festuca octoflora Walt., typical; not the plant of the northern states which has passed under this name. See Fernald, Rhodora **34**: 209 (1932). Sandy roadsides, Myrtle Beach, no. 16,425.

Poa autumnalis Muhl. Border of rich wooded bottom, north of Myrtle Beach, no. 16,407.

Hordeum pusillum Nutt. Bank of causeway through old rice-fields, Georgetown Landing, no. 16,414.

Arundinaria macrosperma Michx. Edge of cypress swamp near Longwood Landing, no. 16,405; old rice-fields along Waccamaw River, Georgetown Landing, no. 16,404.

Eleocharis tricostata Torr. Dry sandy ground in little-used roadway, north of Myrtle Beach, no. 16,452.

Eleocharis tuberculosa (Michx.) R. & S. Ditch in wet pine-barrens south of Socastee, no. 16,432.

Scirpus divaricatus Ell. Swampy bottom, south of Murrell's Inlet, Georgetown Co., no. 16,448.

Carex tribuloides Wahlenb. Edge of wooded swamp north of Myrtle Beach, no. 16,434.

Carex incomperta Bicknell. Margin of pond at golf links, Myrtle Beach, no. 16,443.

Material in the Gray Herbarium precisely similar to our specimen, collected at Aiken by Ravenel, has been named *C. incomperta* by both Mackenzie and Wiegand. It differs, however, from what may be called the norm of that species in its narrow leaves (c. 1 mm. wide) and its small perigynia (c. 2.5 mm. long) with beaks as a rule only ¼–⅓ the length of the body, and ventral faces only finely and faintly, or not at all, nerved. In these latter respects it suggests *C. interior;* from that, however, it differs in the proportionally broader, more deltoid and more stipitate bodies of the perigynia.

It is the sort of variant which, in a group where specific lines are clearer and more stable, might well be treated as a geographic variety.

Carex atlantica Bailey. Wet swale in pine barrens, north of Myrtle Beach, no. 16,466.

Carex seorsa E. C. Howe. Low woods along creek, 4 miles south of Myrtle Beach, no. 16,454.

Carex bromoides Schk. Edge of swamp, 2 miles south of Myrtle Beach, no. 16,463.

Carex laevivaginata (Kükenth.) Mackenzie. Edge of brook, 2 miles south of Myrtle Beach, no. 16,459. Occasional.

Carex stipata Muhl., var. uberior Mohr. Swampy bottom, 3 miles north of Conway, no. 16,430; river swamp, Waccamaw River near Longwood Landing, nos. 16,440, 16,441.

Larger in all its parts, but otherwise not separable from *C. stipata* and best treated, as originally by Mohr, as a geographic variety of that species. In the last collection, kindly determined for us by Mr. Mackenzie, the leaves are deep bluish-green and the very young panicle almost as open and branched as in species of the section *Indocarex*, which superficially the specimens much resemble.

CAREX LEPTALEA Wahlenb., var. HARPERI (Fernald) W. Stone. Dark wooded swamp, Longwood Landing, no. 16,465; wet woods along creek, 4 miles south of Myrtle Beach, no. 14,456.

CAREX STRICTA Lam. In dense stools, swamp at Longwood Landing, no. 16,439.

Not previously reported south of North Carolina. There is, however, another extant specimen from the southern coastal plain. In the Kew Herbarium is a sheet labelled as collected by Asa Gray at Apalachicola, Florida, and the type of *C. semicrinita* C. B. Clarke, Kew Bull. Misc. Inf. Add. Ser. **8**: 70 (1908). A photograph of this specimen and perigynia from it were procured by Mr. Mackenzie in 1922; he then determined it as certainly *Carex stricta*. Dr. Gray apparently kept none of this collection; there is no trace of it in the Gray Herbarium now.

CAREX NIGROMARGINATA Schwein. Dry mixed woods, 2 miles south of Myrtle Beach, nos. 16,461, 16,460; sandy pine barrens, 5 miles south of Myrtle Beach, no. 16,435.

The last number, growing in the loose white sand which is a particularly characteristic soil of long-leaf pine-lands, is not typical, showing a distinct transition toward var. **floridana** (Schwein.) n. comb. (*Carex floridana* Schwein. Ann. Lyceum N. Y. **7**: 66 (1824)), which appears to be only a variety with long stolons, pale scales, less fibrillose sheaths, and blunter pistillate scales. We find other transitional specimens in the Gray Herbarium, in particular the material from southeastern Virginia which is the only basis known to us for records of *C. floridana* from the Gray's Manual region.

CAREX TRICEPS Michx., var. SMITHII Porter (*C. caroliniana* Schwein.). Alluvial woods along Waccamaw River, opposite Sandy Island, no. 16,447.

In its extreme state appearing distinct from *C. triceps*, but connected with it by numerous transitions in the northern part of its range.

CAREX DEBILIS Michx. Open woods at edge of rich creek-bottom, 4 miles south of Myrtle Beach, no. 16,457; swampy woods along Waccamaw River above Sandy Island, no. 16,446.

South Carolina is the type locality of *C. debilis;* our material well represents the typical form. In Mackenzie's recent treatments of *Carex,* the species is recorded north to New Jersey; but the northern specimens show a distinct approach to var. *Rudgei.* Small's statement of the range of *C. debilis* "South Carolina to Florida and Louisiana" (Fl. s e. U. S. 2nd ed., 212 (1913)) seems better to represent the range of the strictly typical form.

CAREX OXYLEPIS Torr. & Hook. Rich woods at edge of creek-bottom, 4 miles south of Myrtle Beach, no. 16,455.

CAREX STYLOFLEXA Buckley. Swamp in rich bottom, 4 miles south of Myrtle Beach, no. 16,437.

CAREX STRIATULA Michx. Dry open mixed woods, 2 miles south of Myrtle Beach, no. 16,458.

CAREX AMPHIBOLA Steud. Open deciduous woods, Pine Island Road, west of Myrtle Beach, no. 16,426.

In the Gray Herbarium there are no specimens of this species from any station between the District of Columbia and northeastern Florida.

CAREX ABSCONDITA Mack. Open deciduous woods, Pine Island Road, west of Myrtle Beach, no. 16,428; rich wooded river bank, Waccamaw River, below Longwood Landing, no. 16,445.

CAREX WALTERIANA Bailey. In ditch, wet pine barrens south of Socastee, no. 16,433.

CAREX VERRUCOSA Muhl. Roadside ditch in wet pine-lands near Burgess P. O., no. 16,438.

Muhlenberg's name is here applied, in accordance with Mackenzie's treatment in Small, Fl. s. e. U. S., ed. 2, 1324 (1913), to the stout, very glaucous plant with stiffly erect pistillate spikes and glaucous, nerved perigynia represented by our specimens. Mackenzie seems happily to have resolved the confusion hitherto attending the use of this name and of *C. glaucescens* Ell.

There is no specimen of *C. glaucescens* in Elliott's herbarium. There is a specimen of our plant labelled "Carex Verrucosa Schkur flaccae affin: Flor. Aprile in fossis circiter 20 mil: Charleston juxta viam ad Jacksonborough." To this Olney, who at one time worked over Elliott's Carices, has added: "C. verrucosa Muhl. glaucescens Ell."; and he distributed South Carolina material like Elliott's specimen under the latter name with *C. verrucosa* as a synonym. This failure to distinguish *C. glaucescens,* definitely described by Elliott as with "spicis . . . . demum pendulis; corollis . . . . enerviis" has doubtless been responsible for some of the later confusion.

As interpreted by Mackenzie, *C. verrucosa* is a species strictly of the southern coastal plain, ranging, as indicated by the specimens in the Gray Herbarium, from South Carolina to Texas (Wright, without no.).

CAREX RIPARIA Curtis, var. IMPRESSA S. H. Wright. Marshes along estuary of Waccamaw River, Georgetown Landing, no. 16,451.

CAREX COMOSA Boott. Edge of artificial pond at Golf Club, Myrtle Beach, no. 16,453.

CAREX INTUMESCENS Rudge. Rich river swamp, Waccamaw River below Longwood Landing, no. 16,442; open deciduous woods, Pine Island Road, west of Myrtle Beach, no. 16,429.

CAREX SMALLIANA Mackenzie (*C. folliculata*, var. *australis* Bailey). Roadside ditch and in moist woodland, Pine Island Road, west of Myrtle Beach, no. 16,427; swampy alluvial woods, Ball Creek, Waccamaw River, no. 16,449.

A striking species in the field, in aspect intermediate between *C. folliculata* and *C. Collinsii*.

CAREX GIGANTEA Dewey. Swamp along Waccamaw River, opposite Sandy Island, no. 16,450.

SABAL PALMETTO (Walt.) R. & S. South Island and south side of the Georgetown estuary; three stunted trees on North Island, Georgetown Co.

No specimens were taken, but a photograph was made by Mrs. Robert Walcott, and is reproduced in fig. 1, with her kind permission.

ORONTIUM AQUATICUM L. River marshes above Georgetown, no. 16,471.

ARISAEMA TRIPHYLLUM (L.) Schott. Edge of swamp 4 miles south of Myrtle Beach.

Forms with the dilated portion of the spathe blackish-purple within, short-acuminate, not constricted below (no. 16,467); with green, acuminate spathes (no. 16,468); with green spathes abruptly contracted to a mucronate apex (no. 16,469); and with green spathe intermediate in shape between the two preceding (no. 16,470) grew together at this station. No. 16,468 with dilated portion of spathe 4 cm. wide and 9 cm. long, answers fairly well to the description of *A. acuminatum* Small, but here plainly passes into the common form of *A. triphyllum* which is well represented by our no. 16,467.

LEMNA CYCLOSTASA (Ell.) Chev. Shallow artificial pond on golf-links, Myrtle Beach, no. 16,472.

ERIOCAULON COMPRESSUM Lam. Cypress swamp, Waccamaw River below Conway, no. 16,473.

TRADESCANTIA ROSEA Vent. Dry, sandy oak-barrens, 6 miles north

of Myrtle Beach, no. 16,474. The narrow-leaved plant described as *Cuthbertia graminea* Small.

Juncus Elliottii Chapm. Common in wet ditches throughout pine barrens south of Socastee, no. 16,475.

Amianthium Muscaetoxicum (Walt.) Gray. Edge of swampy depression in pine barrens, 10 miles northeast of Georgetown, no. 16,482.

Nothoscordum bivalve (L.) Britton. Rich bottom, Myrtle Beach, no. 16,484; rich pine woods, Pine Island, no. 16,483.

Smilax Bona-nox L. Thicket along ditch near Georgetown Landing, no. 16,481.

Smilax rotundifolia L. Rich bottom woods, 4 miles south of Myrtle Beach, no. 16,476.

Smilax Walteri Pursh. Rich bottom, near Socastee, no. 16,477; river swamp, Waccamaw River below Peach Tree, no. 16,478.

Smilax laurifolia L. Low woods along creek, 4 miles south of Myrtle Beach, no. 16,479.

Smilax laurifolia L., var. bupleurifolia Delile ex A. DC. Banks of Waccamaw River below Peach Tree, no. 16,480.

Aletris farinosa L. Wet pine barrens one mile north of Little River, no. 16,485.

Hypoxis hirsuta (L.) Coville, var. leptocarpa (Engelm. & Gray) Brackett. Rich woods along road to Pine Island, no. 16,488; edge of creek, 4 miles south of Myrtle Beach, no. 16,487.

Hypoxis micrantha Pollard. Wet pine-lands near Burgess P. O., no. 16,489.

Apparently a rare and local species.

Zephyranthes Atamasco (L.) Herb. Sandy pine woods south of Myrtle Beach, no. 16,490.

A characteristic and most attractive plant of moist creek-bottoms.

Iris virginica L. (det. Small). Swampy woods, Longwood Island, Waccamaw River, no. 16,493; edge of cypress swamp, Socastee, no. 16,492; river swamp, Conway, no. 16,495.

Variable in color and shape of floral parts.

Spiranthes gracilis (Bigel.) Beck. Wet pine barrens south of Socastee, no. 16,496.

Spiranthes vernalis Engelm. & Gray. Wet pine barrens south of Socastee, no. 16,497.

Calopogon barbatus (Walt.) Ames. (*C. graminifolius* Ell.) Pine-lands, 10 miles northeast of Georgetown, no. 16,498.

A charming little plant.

Malaxis unifolia Michx. Sandy pine woods, 6 miles north of Myrtle Beach, no. 16,499.

Salix nigra Marsh. Roadside ditch, Conway, no. 16,506.

SALIX LONGIPES Anders., var. WARDI (Bebb) Schneid. Open bushy swamp, Longwood Island, no. 16,517.

MYRICA CERIFERA L. Sandy swamp near beach, 10 miles north of Myrtle Beach, no. 16,505.

One of the commonest shrubs of the region.

CARYA CORDIFORMIS (Wang.) K. Koch. Edge of swamp near Longwood Landing, no. 16,503.

ALNUS RUGOSA (Du Roi) K. Koch. Edge of swamp, 2 miles south of Myrtle Beach, no. 16,511.

CASTANEA PUMILA Mill. Edge of swampy depression, 10 miles south of Myrtle Beach, no. 16,504.

QUERCUS LAURIFOLIA Michx. Cypress swamp, Myrtle Beach, no. 16,501.

QUERCUS MARILANDICA Muench. Woods, 2 miles south of Myrtle Beach, no. 16,509.

QUERCUS VIRGINIANA Mill. Woods, 2 miles south of Myrtle Beach, no. 16,512.

QUERCUS VIRGINIANA Mill., var. GEMINATA (Small) Sargent (det. E. J. Palmer).

QUERCUS RUBRA L., var. TRILOBA Ashe. Woods, 2 miles south of Myrtle Beach, no. 16,510.

A rather tall shrub or low rambling tree, sand-dune hollows, Pawley's Island, Georgetown Co., no. 16,519.

MORUS RUBRA L. Rich woods, 2 miles south of Myrtle Beach, no. 16,520.

CELTIS LAEVIGATA Willd. Bank of river marsh, Georgetown Landing, no. 16,516.

ASARUM ARIFOLIUM Michx. Rich open woods, 2 miles south of Myrtle Beach, no. 16,500.

RUMEX HASTATULUS Baldw. Roadside weed, Myrtle Beach, no. 16,508.

This and *Linaria canadensis* are the commonest weeds of the region on roadsides and in old fields.

RUMEX VERTICILLATUS L. River marsh, Georgetown Landing, no. 16,515.

NYMPHOZANTHUS SAGITTAEFOLIUS (Walt.) Fern. Ditch in marshes, near Georgetown Landing, no. 16,529; Waccamaw River, off Longwood Landing, no. 16,528.

A water-lily so strikingly distinct in aspect as this local species of the southern coastal plain is a joy to the collector.

SAGINA DECUMBENS (Ell.) T. & G. A weed in waste ground at Longwood Landing, no. 16,524.

STELLARIA UNIFLORA Walt. Edge of small stream by golf links, Myrtle Beach, no. 16,523.

Silene antirrhina L. Sandy roadside, Myrtle Beach, no. 16,522.

Ranunculus palmatus Ell. Edge of water-course in swampy bottom, 3 miles north of Conway, no. 16,526.

Ranunculus pusillus Poir. Swampy bottom, 3 miles north of Conway, no. 16,527; damp ditch, 2 miles south of Myrtle Beach, no. 16,525; river swamp, Longwood Landing, no. 16,531.

A common species in suitable habitats throughout the region.

Clematis crispa L., var. Walteri (Pursh) Gray. Edge of rich bottom along creek, 4 miles south of Myrtle Beach, no. 16,530.

Magnolia virginiana L. Along roadside 3 miles east of Conway, no. 16,521.

One of the most deliciously fragrant of North American flowers.

Sanguinaria canadensis L., var. rotundifolia (Greene) Fedde. Dry mixed woods, 2 miles south of Myrtle Beach, no. 16,533.

This southern variety, characterized by the nearly or quite entire margins of the lobes of the leaf (which are sometimes narrowly oblong) and by the coarse and inconspicuous venous reticulation of the under surface, is represented in the Gray Herbarium by the following collections in addition to ours:

Georgia: rich woods west of Americus, Sumter Co., July 31, 1901, *Harper*, no. 1146 (type collection of *S. rotundifolia* Greene). Florida: rich woods, limestone outcrops, near Marianna, Jackson Co., April 12, 1929, *E. J. Palmer*, no. 35,295. Tennessee: rich, wooded slope, Hollow Rock Jc., Aug. 27, 1922, *Svenson*, no. 365 (leaves only). Missouri: woods in rich soil, near London, alt. 1400 ft., May 23, 1911, *Lansing*, no. 2945.

Corydalis micrantha (Engelm.) Gray. Sandy field south of Murrell's Inlet, Georgetown Co., no. 16,532.

In this region apparently occurs only as a weed in neglected fields.

Podophyllum peltatum L. Rich bottom woods, 4 miles south of Myrtle Beach, no. 16,534.

Lepidium virginicum L.? Sandy roadside near golf club-house, Myrtle Beach, no. 16,541. Radical leaves pinnate.

Coronopus didymus (L.) Smith. Roadside, Georgetown Landing, no. 16,543.

Sisymbrium altissimum L. Dry sandy roadside, Myrtle Beach, no. 16,546.

Arabidopsis Thaliana (L.) Schur. Low depression in deep woods, Longwood Landing, no. 16,544.

Cardamine bulbosa (Schreb.) BSP. Wet woods, 2 miles south of Murrell's Inlet, Georgetown Co., no. 16,542.

Cardamine pensylvanica Muhl. Swampy bottom, 2 miles south of Murrell's Inlet, Georgetown Co., no. 16,545.

DIONAEA MUSCIPULA Ellis. Pine-lands, 10 miles northeast of Georgetown, no. 16,539.

A small colony, the only one seen. Because of the drought and the frequent fires in the pine-lands, the species was apparently, and at least for the time being, nearly absent from the region visited.

DROSERA BREVIFOLIA Pursh. Roadside ditch in pine-lands, 10 miles northeast of Georgetown, no. 16,538.

A neat and attractive little plant, the slender scapes rising from a small and very symmetrical rosette of leaves, the white flowers 1 cm. in diameter.

SARRACENIA PURPUREA L. Wet pine barrens, 1 mile north of Little River, no. 16,536.

SARRACENIA FLAVA L. Moist pine barrens, Georgetown Co., 10 miles southwest of Conway, no. 16,535; wet pine barrens, 1 mile north of Little River, no. 16,537.

Frequent in wet pine-lands. *S. rubra* was also observed, but not collected.

FOTHERGILLA GARDENI Murr. Swampy depression in pine woods, 10 miles north of Myrtle Beach, no. 16,547; low pine-lands, 2 miles southwest of Georgetown, no. 16,548.

At least at this season, when the leaves are undeveloped, we found it impossible to recognize the proposed segregate (*F. parvifolia* Kearney), which is supposed to occur in pine-lands of the coastal plain.

PYRUS ARBUTIFOLIA (L.) L. f. Sandy pine woods, Myrtle Beach, no. 16,550.

Ubiquitous and in full bloom the first week in April.

PYRUS ANGUSTIFOLIA Ait. Rich pine woods, south of Myrtle Beach, no. 16,552.

PRUNUS UMBELLATA Ell. Rich pine woods, Myrtle Beach, no. 16,551.

PRUNUS ANGUSTIFOLIA Marsh. Roadside near Longwood Landing, no. 16,549.

LAUROCERASUS CAROLINIANA (Mill.) Roem. In dense thickets in sand-dune hollows, Pawley's Island, no. 16,553.

CROTALARIA ROTUNDIFOLIA (Walt.) Poir. Dry sandy pine barrens, weed in roadway, Golf Club, Myrtle Beach, no. 16,556.

LUPINUS PERENNIS L. Dry oak barrens, 6 miles north of Myrtle Beach, no. 16,561.

LUPINUS DIFFUSUS Nutt. Dry loose sand, Sandy Island, Georgetown Co., no. 16,559; dry sandy pine-lands, 4 miles north of Georgetown Landing, no. 16,560.

LUPINUS VILLOSUS Willd. Dry loose sand, 1 mile north of Myrtle Beach, no. 16,562.

In its simple leaves and red flowers quite unlike the conventional lupine: and forming with the preceding and several similar species of southern Brazil a conspicuously marked section of the genus.

Trifolium carolinianum Michx. Waste ground, Longwood Landing, no. 16,568.

Robinia nana Ell. Sandy oak barrens, 3 miles north of Myrtle Beach, no. 16,555.

A low, straggling shrub with brilliant deep-pink flowers.

Robinia albicans Ashe. Dry sandy pine barrens, 6 miles south of Myrtle Beach, no. 16,565.

Our specimens agree well with authentic material of *R. albicans* lent us from the National Herbarium through the kindness of Dr. Maxon. Especially and characteristically in the wand-like shoots unbranched except at apex, the sparse loose pubescence of pedicels, rachises and calyx, and the entire absence of bristles, do they accord with it. *R. albicans* was described from the mountain region of southwestern North Carolina and so far as we know has not hitherto been reported elsewhere. The occurrence of the same species in the Alleghanies and the coastal plain is not to be too confidently expected, but is by no means without precedent. Doubt is cast on Rydberg's surmise that *R. albicans* is a hybrid of *R. Pseudo-Acacia* and *R. Boyntoni* by the occurrence of the supposed hybrid at a locality where neither of its putative parents is known.

Wisteria frutescens (L.) Poir. Rich wet bottoms near Socastee, no. 16,554; thickets along Waccamaw River, Georgetown Landing, no. 16,564.

Amorpha fruticosa L. Roadside ditch near Burgess P. O., no. 16,563.

Vicia angustifolia (L.) Reichard, var. segetalis (Thuill.) Koch. Roadside weed, Georgetown Landing, no. 16,557.

Oxalis filipes Small. Dark rich swampy woods near Longwood Landing, no. 16,567.

Plants weak, slender and delicate, partly decumbent.

Oxalis stricta L. Abundant on sandy roadsides, Myrtle Beach, no. 16,568.

Stout, erect, with large flowers.

Tamarix gallica L. Abundant on sand dunes, Pawley's Island, Georgetown Co., no. 16,576.

Polygala lutea L. Sandy roadside excavation, 2 miles southwest of Georgetown, no. 16,569.

Ceratiola ericoides Michx. In pure white sand in oak barrens, 4 miles north of Myrtle Beach, no. 16,574.

EUPHORBIA MARILANDICA Greene (pubescent form). One plant only among scattered individuals of *E. Ipecacuanhae*, dry sandy roadside, 2 miles north of Myrtle Beach, no. 16,573.

Reported only from near the type locality in Anne Arundel Co., Maryland; there is, however, in the Gray Herbarium a fragmentary specimen collected near Augusta, Ga., *Olney and Metcalf*, no. 273, which apparently belongs here.

EUPHORBIA IPECACUANHAE L. Dry sand, 2 miles north of Myrtle Beach, nos. 16,571 (an upright, large-leaved state) and 16,572.

CNIDOSCOLUS STIMULOSUS (Michx.) Gray. Sandy pine barrens, rather common; our specimens from near Golf Club, Myrtle Beach, no. 16,570.

CALLITRICHE PALUSTRIS L. Emersed plants, prostrate on mud, marshes of Waccamaw River, Georgetown Landing, no. 16,575.

ILEX OPACA Ait., f. SUBINTEGRA Weatherby. Four miles south of Myrtle Beach, no. 16,578.

ILEX LUCIDA (Ait.) T. & G. Woods 1 mile north of Little River, no. 16,582; border of swamp in pine-lands, Myrtle Beach, no. 16,577.

ILEX DECIDUA Walt. Edge of river swamp, Conway, no. 16,579; river swamp, Longwood Island, Georgetown Co., no. 16,580.

ILEX VOMITORIA Ait. Rich woods south of Murrell's Inlet, Georgetown Co., no. 16,581.

Rather common, especially just along the coast.

RHUS QUERCIFOLIA (Michx.) Steud. Roadside near Longwood Landing, no. 16,583.

AMPELOPSIS ARBOREA (L.) Koehne. Woody, high-climbing vine, thicket at edge of river marsh, Georgetown Landing, no. 16,566.

AESCULUS PAVIA L. Rich bottom, Myrtle Beach, no. 16,584.

A conspicuous feature of the spring flora.

HELIANTHEMUM CAROLINIANUM (Walt.) Michx. Dry open woods, 2 miles south of Myrtle Beach, no. 16,585; sandy fields south of Murrell's Inlet, Georgetown Co., no. 16,586.

VIOLA AFFINIS LeConte? Rich pine woods, south of Myrtle Beach, no. 16,590.

VIOLA SEPTEMLOBA LeConte. Sandy pine barrens, 5 miles south of Myrtle Beach, no. 16,593; rather small plants with leaves mostly three-lobed—the form described as *V. vicinalis* Greene and *V. insignis* Pollard. Low damp place in long-leaf pine woods, 2 miles north of Myrtle Beach, no. 16,588. Leaves with small basal lobes, otherwise uncut; flowers unusually large. *V. septemloba* appeared to be the commonest violet of the region.

VIOLA TRILOBA Schwein.? Dry sandy pine woods, south of Myrtle Beach, no. 16,589.

VIOLA LANCEOLATA L. Wet roadside ditch in pine-lands near Burgess P. O., no. 16,592; roadside ditch, 3 miles out of Socastee, no.

16,591 (pubescent form); pine-lands, 10 miles northeast of Georgetown, Georgetown Co., no. 16,587.

Our material seems definitely to belong with typical *V. lanceolata* rather than with var. *vittata*,[1] which differs only in its linear aestival leaves, subulate bractlets and narrowly lanceolate sepals. It is none too clearly distinguishable and seems best treated as a southern variety of *V. lanceolata*.

OPUNTIA HUMIFUSA Raf. Edge of road in sandy mixed woods, 2 miles south of Myrtle Beach.

A shade form with rather narrowly elliptic joints (see Britton & Rose, Cactaceae **1**: 128). In this respect it resembles *O. macrarthra* Gibbes; but a plant brought back and, through the kindness of Mr. Lazenby, brought to flower at the Harvard Botanic Garden, produced the characteristic blossom of *O. humifusa*.

OENOTHERA LACINIATA Hill. Sandy field south of Murrell's Inlet, Georgetown Co., no. 16,594.

OENOTHERA **subglobosa** (Small), n. comb., var. **arenicola** (Small), n. comb. *Kneiffia subglobosa* Small, Bull. Torr. Bot. Club **23**: 177 (1896). *K. arenicola* Small, Fl. s.e. U. S. 842 (1903). Recently burnt-over pine-lands near Burgess P. O., no. 16,595.

The plant of the Coastal Plain, represented by our specimens, differs from typical *Oe. subglobosa* of the Piedmont only in its longer and denser pubescence and is apparently best treated as a variety.

MYRIOPHYLLUM HETEROPHYLLUM Michx. Shallow water of artificial pond, Golf Club, Myrtle Beach, no. 16,596.

SPERMOLEPIS DIVARICATA (Walt.) Raf. Sandy roadside, near Georgetown Landing, no. 16,597.

LILAEOPSIS CAROLINIANA Coult. & Rose. Shallow water of run and artificial pond, Golf Club, Myrtle Beach, no. 16,598.

Our collection of this very local endemic species of the coastal plain helps to fulfill Coulter & Rose's prediction that it would be found in the region intervening between the two localities known to them in 1900 and to Small in 1913—eastern North Carolina and Louisiana. In our young and mostly submersed material, the leaf-blades are not well developed and the fruit is immature, but the habitat of the plant in fresh water and the elongated leaves much exceeding the peduncles, place it definitely with this species.

NYSSA SYLVATICA Marsh. Banks of Waccamaw River, below Peach Tree, no. 16,601.

NYSSA BIFLORA Walt. River swamp, Waccamaw River, Longwood Island, Georgetown Co., no. 16,603.

[1] VIOLA LANCEOLATA var. **vittata**, n. comb. *V. vittata*, Greene, Pittonia 3: 258 (1898).

Apparently much less common than the other two species.

NYSSA AQUATICA L. Bank of Waccamaw River, opposite Sandy Island, no. 16,600.

Flowering one to two weeks later than *N. sylvatica*.

CORNUS FLORIDA L. Dry mixed woods, 2 miles south of Myrtle Beach, no. 16,599.

One of the most abundant species of the Southeast, vying in numbers with such weeds as *Linaria canadensis*.

RHODODENDRON CANESCENS (Michx.) Sweet. High shrub in rich bottom, edge of stream 3 miles north of Myrtle Beach, no. 16,606. Seen only here.

RHODODENDRON ATLANTICUM (Ashe) Rehder. Low shrub in sandy woods, 5 miles south of Myrtle Beach, no. 16,605; dry pine-lands, 5 miles south of Conway, no. 16,604.

A frequent and characteristic plant of the pine-lands, often occurring in large colonies and attractive because of its large pink flowers which exhale a strong, carnation-like fragrance. First noticed in flower April 7, but not in full bloom till about the 20th.

LEUCOTHOE RACEMOSA (L.) Gray. Swampy bottom in rich woods near Socastee, no. 16,611; swampy border of Waccamaw River near Conway, no. 16,612; bank of the Waccamaw River near Bull Creek, no. 16,613.

The last two collections were remarkable for their extremely long racemes, up to 2.5 dm. In this respect they resemble *L. elongata* Small, but lack the technical characters of calyx, etc. on which that species is founded.

LEUCOTHOE AXILLARIS (Lam.) D. Don. Low thicket along stream, Myrtle Beach, no. 16,609; rich pine woods, Pine Island, no. 16,608.

XOLISMA LUCIDA (Lam.) Rehd. Roadside thicket, 2 miles north of Conway, no. 16,610; edge of swamp, 2 miles south of Myrtle Beach, no. 16,607 (extreme form with large, broadly elliptic leaves, rather lax branching and few flowers).

GAYLUSSACIA FRONDOSA (L.) T. & G. Dry sandy pine-barrens, Myrtle Beach, no. 16,614.

VACCINIUM CRASSIFOLIUM Andrews. Prostrate and rooting at the nodes, the long shoots hanging over the sides of a roadside ditch, in pine-lands near Socastee, no. 16,622.

A peculiar plant, appearing to New England eyes like an enlarged edition of the creeping snowberry.

VACCINIUM NEGLECTUM (Small) Fernald. Dry oak barrens, 4 miles north of Myrtle Beach, no. 16,615.

VACCINIUM ARBOREUM Marsh. Dry oak barrens, 4 miles north of Myrtle Beach, no. 16,617.

VACCINIUM VIRGATUM Ait. Moist soil in pine woods, 5 miles south of Myrtle Beach, no. 16,619 (fls. white).

VACCINIUM VIRGATUM Ait., var. TENELLUM (Ait.) Gray. Dry woods, 2 miles south of Myrtle Beach, no. 16,620 (fls. white); same locality, no. 16,620a (fls. pink); dry swampy pine barrens, 10 miles north of Myrtle Beach, no. 16,621 (fls. pink).

Low shrubs branched from the base only, mostly not more than 5 dm. high.

VACCINIUM ELLIOTTII Chapm. Alluvial woods along Waccamaw River, opposite Sandy Island, no. 16,616.

VACCINIUM ATROCOCCUM (Gray) Heller. Dry sandy woods, 2 miles north of Myrtle Beach, no. 16,618.

Shrubs 1 m. high; flowers white or pinkish.

STYRAX AMERICANA Lam. Waccamaw River bank below Longwood Landing, no. 16,627 (f. GLABRA J. Perk.); river swamp, Waccamaw River below Peach Tree, no. 16,628 (f. TYPICA).

SYMPLOCOS TINCTORIA (L.) L'Hér. Small spreading tree, 5 m. high, in dry or moist mixed woods, Pine Island road, Myrtle Beach, no. 16,629.

OSMANTHUS AMERICANA (L.) Benth. & Hook. Hollows in sand dunes, Pawley's Island, Georgetown Co., no. 16,635.

Flowers with a faint fragrance of orange blossoms.

CHIONANTHUS VIRGINICA L. Low woods, Longwood Landing, no. 16,625.

GELSEMIUM SEMPERVIRENS (L.) Ait. f. Sandy pine barrens, Myrtle Beach, no. 16,626. Common.

SAMOLUS PARVIFLORUS Raf. On brook-margins, 4 miles south of Myrtle Beach, no. 16,624.

Frequent in similar situations.

ASCLEPIAS HUMISTRATA Walt. Sandy oak barrens, 6 miles north of Myrtle Beach, no. 16,630.

SALVIA LYRATA L. Sandy roadside, 10 miles south of Myrtle Beach, no. 16,632.

Not common near the coast, much more so farther inland.

LAMIUM AMPLEXICAULE L. Sandy roadside, south of Murrell's Inlet, Georgetown Co., no. 16,631.

GRATIOLA VIRGINIANA L. (*G. sphaerocarpa* Ell.) Along brook, 2 miles south of Myrtle Beach, no. 16,633.

Flowers snow-white.

PEDICULARIS CANADENSIS L., f. PRAECLARA A. H. Moore. Rich bottom woods, 4 miles south of Myrtle Beach, no. 16,634.

CONOPHOLIS AMERICANA (L. f.) Wallr. Parasitic on oak roots, 2 miles south of Myrtle Beach, no. 16,623.

Bignonia capreolata L. Border of rich swampy bottom, 2 miles east of Conway, no. 16,636.

Utricularia subulata L. Roadside ditch in pine-lands, 3 miles east of Conway, no. 16,638.

Pinguicula elatior Michx. Wet pine barrens, Pine Creek, no. 16,637; near Burgess P. O., no. 16,639.

Plantago virginica L. Dry pine woods south of Myrtle Beach, no. 16,642; deep, loose sand of roadside, 1 mile north of Georgetown Landing, no. 16,640.

The latter collection with narrowly oblanceolate leaves.

Plantago elongata Pursh. Sandy field, Longwood Landing, no. 16,641.

Houstonia patens Ell. Sandy pine-barrens, Myrtle Beach, no. 16,646.

Flowers deep violet-blue.

Viburnum dentatum L. Waccamaw River, below Peach Tree, no. 16,644.

Viburnum rufidulum Raf. Rich woods, 2 miles south of Myrtle Beach, no. 16,643.

Lonicera sempervirens L. Roadside thicket, 3 miles south of Conway, no. 16,645.

Specularia perfoliata (L.) A. DC. Sandy bank at border of woods, Longwood Landing no. 16,647.

Erigeron quercifolius Lam. Roadside ditch, 2 miles north of Conway, no. 16,672; dry sandy field, Myrtle Beach, no. 16,649.

Erigeron vernus (L.) T. & G. Roadside ditches, 5 miles southeast of Conway, no. 16,651; wet ditch in pine barrens, south of Myrtle Beach, no. 16,668; wet pine barrens, 1 mile north of Little River, no. 16,673.

Gnaphalium spathulatum Lam. Roadside weed, Myrtle Beach, no. 16,669. Frequent.

Gnaphalium falcatum Lam. Dry sandy roadside, 4 miles south of Myrtle Beach, no. 16,655.

Gnaphalium purpureum L. Dry sandy field and roadside, Myrtle Beach, nos. 16,650, 16,666. Flowers pink.

Chaptalia semifloscularis (Walt.) Robinson. Moist depressions in pine-barrens, 2 miles north of Myrtle Beach, no. 16,654; moist pine-barrens, 10 miles southwest of Conway, no. 16,648. Flowers pale rose.

Chrysogonum virginianum L. Dry wood-margin and open woods at border of rich bottom, 4 miles south of Myrtle Beach, no. 16,653.

Helenium Nuttallii Gray. Damp pine barrens south of Myrtle Beach, no. 16,674; moist pine barrens, 10 miles south of Conway, no. 16,675.

Senecio glabellus Poir. Swamp 7 miles north of Conway, no. 16,667.

Arnica acaulis (Walt.) BSP. Pine-lands, 10 miles northeast of Georgetown, no. 16,652.

Cirsium horridulum Michx., var. Elliottii T. & G. Dry sandy roadside, 5 miles south of Murrell's Inlet, Georgetown Co., no. 16,676.

Very stout, hollow-stemmed plants about 8 dm. high; corollas purple.

Krigia virginica Willd. Dry loose sand along roadway, 4 miles north of Myrtle Beach, no. 16,671; roadside, south of Myrtle Beach, no. 16,670.

Pyrrhopappus carolinianus (Walt.) DC. Wet pine barrens, 1 mile north of Little River, no. 16,677.

One plant, the only one observed.

The following lists, embodying the results of a day and a half of roadside botanizing by the senior author, are appended not because they have any significant connection with the lists from Myrtle Beach, but because, in the absence of any recent detailed account of the flora of South Carolina, almost any exact record of locality may be of interest to the student of distribution.

Plants of the Sand-hills of Orangeburg and Lexington Counties south and west of Columbia.

Panicum oligosanthes Schult. Dry roadside south of the Congaree River opposite Columbia, no. 6112.

Danthonia sericea Nutt. Dry open woods near Pelion, no. 6128.

Carex Smalliana Mackenzie. By water-course in open, near Swansea, no. 6125.

Eriocaulon decangulare L. Open and shaded muddy places at crossing of Congaree Creek, south of Columbia, no. 6123.

Tradescantia rosea Vent. *Cuthbertia graminea* Small. Thin dry woods, south of the Congaree River opposite Columbia, no. 6116.

Nolina georgiana Michx. Dry pine woods near Swansea, no. 6127.

Just coming into flower; perhaps not certainly determinable without fruit, but apparently this species rather than the Floridian *N. atopocarpa* Bartl. According to Bartlett, Rhodora **11**: 80 (1909), records from South Carolina previous to that date rest only on the statement in Elliott's "Sketch."

Stipulicida setacea Michx. Dry pine woods near Pelion, no. 6132.

The thread-like scapes were almost invisible against the back-

ground of brown pine-needles which covered the basal rosette of leaves.

ARENARIA CAROLINIANA Walt. Dry pine lands north of Congaree Creek, no. 6117.

SILENE CAROLINIANA Walt. Dry open mixed woods, south of the Congaree River opposite Columbia, no. 6114.

Pubescent with long, matted hairs; radical leaves oblanceolate to broadly obovate, obtuse or mucronulate, the cauline oblong or linear-oblong, acute; petals white or tinged with pink; teeth of the glandular-viscid calyx red. This is apparently a pale-flowered phase of true *Silene caroliniana* Walt., which is described as with "foliis radicalibus tomentosis obtusis caulinis . . . acutioribus." Our specimens are well matched, except in color of flowers, by the following collections in the Gray Herbarium. SOUTH CAROLINA: Santee Canal, *Ravenel;* vicinity of Charleston, *B. L. Robinson*, no. 58. GEORGIA: near Waynesboro, Burke Co., *Harper*, no. 2075. The more northern, thinly pubescent plant with narrow, acute radical leaves, is *S. pensylvanica* Michx., and may well be varietally separable.

LUPINUS DIFFUSUS Nutt. Wood-margin near Raymond, no. 6107.

BAPTISIA ALBA (L.) R. Br. Dry open woods near North, no. 6111.

Plants about 1 m. tall with long, slender spikes of white flowers, their keels tinged with greenish yellow.

EUPHORBIA GRACILIS Ell. Dry, thin woods, south of the Congaree River opposite Columbia, no. 6115.

A pubescent state, most of the plants seen with geometrically linear leaves, 2.5–3 cm. long and about 3 mm. wide, the sides precisely parallel and the apex abruptly truncate.

EUPHORBIA CURTISII Engelm. Dry pine woods, with *Stipulicida*, near Pelion, no. 6133.

A species rather well marked, in a difficult group, by its tiny involucres and nearly sessile capsules.

VIOLA PEDATA L., var. RANUNCULIFOLIA (Juss.) Ging. ex DC. Prod. **1**: 291 (1824). *V. ranunculifolia* Juss. ex Poir. Encycl. **8**: 626 (1808). *V. digitata* LeConte ex Pursh, Fl. Am. Sept. 171 (1814). Open dry woods, south side of the Congaree River, opposite Columbia, no. 6113.

This variety, characterized by having leaves divided only to the middle, merely dentate or even entire, was carefully and well described by Poiret. The writers hope to discuss the variations of *V. pedata* in detail in a later paper.

Vaccinium caesium Greene. Dry mixed woods, near Raymond, no. 6108.

Styrax americana Lam. Low wet thicket near Swansea, no. 6124.

Amsonia ciliata Walt. Dry pine lands south of Columbia, no. 6120.

Phlox amoena Sims. Dry open woods near Pelion, no. 6130.

Phlox nivalis Lodd. Similar habitat, near North, no. 6109.

Lithospermum caroliniense (Walt.) MacM. Dry wood-margins near North, no. 6110.

Linaria canadensis L. Roadside south of Columbia, no. 6118.

In this region, as elsewhere in the southern coastal plain, a ubiquitous weed.

Utricularia inflata Walt. Shallow pond near crossing of Congaree Creek, south of Columbia, no. 6121.

Berlandiera pumila (Michx.) Nutt. Dry pine-lands, south of Columbia, no. 6119.

Rays clear yellow; disk-flowers deep wine-color.

Coreopsis lanceolata L. Dry, open woods near Pelion, no. 6131.

Marshallia obovata (Walt.) Beadle & Boynton. Dry pine-lands, near Swansea, no. 6127.

Senecio Smallii Britton. Dry, open woods, near Pelion, no. 6128.

Plants of the outer Border of the Piedmont, Saluda County.

In this region there is little topographic difference to mark the passage from the coastal plain to the piedmont. Both exhibit a series of low hills and ridges; the transition is from a sandy to a hard, reddish and clayey soil, with a corresponding change in flora. All the plants in this list were collected in dry, open mixed woods in the piedmont soil, above described. Habitat data are therefore not repeated under each number, but are to be understood for all.

Panicum depauperatum Muhl. Northwest of Saluda, no. 6142.

Potentilla canadensis L. (*P. pumila* Poir.). Northwest of Batesburg, no. 6134.

Baptisia bracteata Ell. Northwest of Saluda, no. 6140.

Psoralea pedunculata (Mill.) Vail. Northwest of Saluda, 6138.

Vicia caroliniana Walt. Climbing on low bushes, same locality as preceding, no. 6144.

Corolla white, tinged with lavender; calyx brownish-pink.

Oxalis violacea L. Northwest of Batesburg, no. 6137.

Corolla varying from pink to violet.

Phlox amoena Sims. Northwest of Saluda, no. 6138.

A form with linear, "somewhat acuminate" leaves, answering to the description of *P. Lighthipei* Small but apparently differing from no. 6130 only in the shape of the leaves.

SCUTELLARIA PARVULA Michx. Northwest of Saluda, no. 6139.
PRUNELLA VULGARIS L., var. HISPIDA Benth. Same locality, no. 6141.
HOUSTONIA LONGIFOLIA Gaertn. Northwest of Batesburg, no. 6135.
HIERACIUM VENOSUM L. Same locality, no. 6136.

Leaves elliptic or obovate, cuneate-based, obtuse or acutish, 4–7 cm. long, the upper surface thinly but evenly hirsute with stiff white or yellowish hairs having dark papillate bases which give a puncticulate effect to the leaf when seen from above.

MOSSES OF SOUTHERN BRITISH HONDURAS AND GUATEMALA[1]

EDWIN B. BARTRAM

THE moss flora of Central America is an exceedingly rich one and still very imperfectly known. It is only by recording the additions from time to time, as they appear, that the groundwork for a comprehensive survey in years to come may gradually be laid.

The species listed below represent two small collections. One by Mr. J. J. White from the vicinity of Punta Gorda, British Honduras which was received through Dr. Carroll W. Dodge from the Missouri Botanical Garden and the other by Dr. J. Bequaert from the Departments of Solola and Chimaltenango, Guatemala, in connection with the Harvard Medical Expedition, which was sent by the Farlow Herbarium.

BRITISH HONDURAS

These collections are all labelled "Punta Gorda, British Honduras" and were collected by Mr. J. J. White in October and November 1932.

FISSIDENS HOOKERIACEUS (C. M.) Par.
FISSIDENS GARBERI Lesq. & James
LEUCOLOMA CRUGERIANUM (C. M.) Jaeg.
OCTOBLEPHARUM ALBIDUM Hedw.
CALYMPERES DONNELLII Aust.
CALYMPERES NICARAGUENSE Ren. & Card.
CALYMPERES LONCHOPHYLLUM Schwaegr.
HYOPHILA TORTULA (Schwaegr.) Hampe
MNIOMALIA VIRIDIS (Mitt.) C. M.

[1] Published with aid to RHODORA from the National Academy of Sciences.

I have referred this last collection here with very little hesitation. The plants are more slender than those from South America but the agreement in every other detail is complete. No important distinction is suggested by the description of *M. Bernoullii* C. M. and I suspect that they are conspecific.

This must be an exceedingly rare and localized plant in Central America. In the numerous collections from this region that I have studied during recent years this is the first time the species has appeared.

Pireella cymbifolia (Sull.) Card.
Meteoriopsis remotifolia (Hornsch.) Broth.
Neckeropsis undulata (Palis.) Broth.
Neckeropsis disticha (Hedw.) Flsh.
Pilotrichum cryphaeoides Schp.

These plants appear to be inseparable from the last species which has previously been known only from Guadeloupe. They agree in every essential particular with a specimen in my herbarium named by Bescherelle, Duss No. 945. It is a rather curious coincidence that both this species and *P. spiculiferum* should share the marked costal structure which distinguishes them from most of their congeners.

Vesicularia amphibola (Spruce) Broth.

Guatemala

Dr. Bequaert advises me that all his mosses came from two localities in the temperate forests, as follows:

Mocá, a finca (or coffee plantation) reached from the R. R. station Guatalon (also the P. O.), Dept. of Solola. Altitude 3000 ft.

Sa. Emilia, a small finca depending from the plantation Pacayal, near the P. O. Pochuta, Dept. of Chimaltenango. Altitude 3200 ft.

From an accompanying sketch map these localities are shown to be about ten miles south of Lake Atitlan.

Breutelia jamaicensis (Mitt.) Jaeg. On shaded soil, Sa. Emilia, Feb., 1931.
Rhodobryum Beyrichianum (Hornsch.) Par. On rock in densely wooded, humid gorge, Mocá, April, 1931.
Pilotrichella pulchella Schp. On tree trunk, Mocá, April, 1931.
Papillaria Deppei (Hornsch.) Jaeg. On tree, Sa. Emilia, February, 1931.
Neckeropsis undulata (Palis.) Broth. Mocá, April, 1931.
Porotrichum cobanense C. M. Mocá, April, 1931.

PILOTRICHUM **spiculiferum** Bartr. sp. nov. FIG. 1. Caulis secundarius ad 7 cm. altus, bipinnatus. Folia caulis secundarii late ovata, acuta, concava, 1.1 mm. longa, 0.6 mm. lata; marginibus toto ambitu denticulata, inferne revolutis; costis attenuatis, ad medium evanidis, dorso laevis; cellulis firmis, papillosis, 5 μ latis, 10–15 μ longis. Folia perichaetialia 2.2 mm. longa, capsula vix exserta, ovalis, fusca, calyptra pilosa. Caetera ignota.

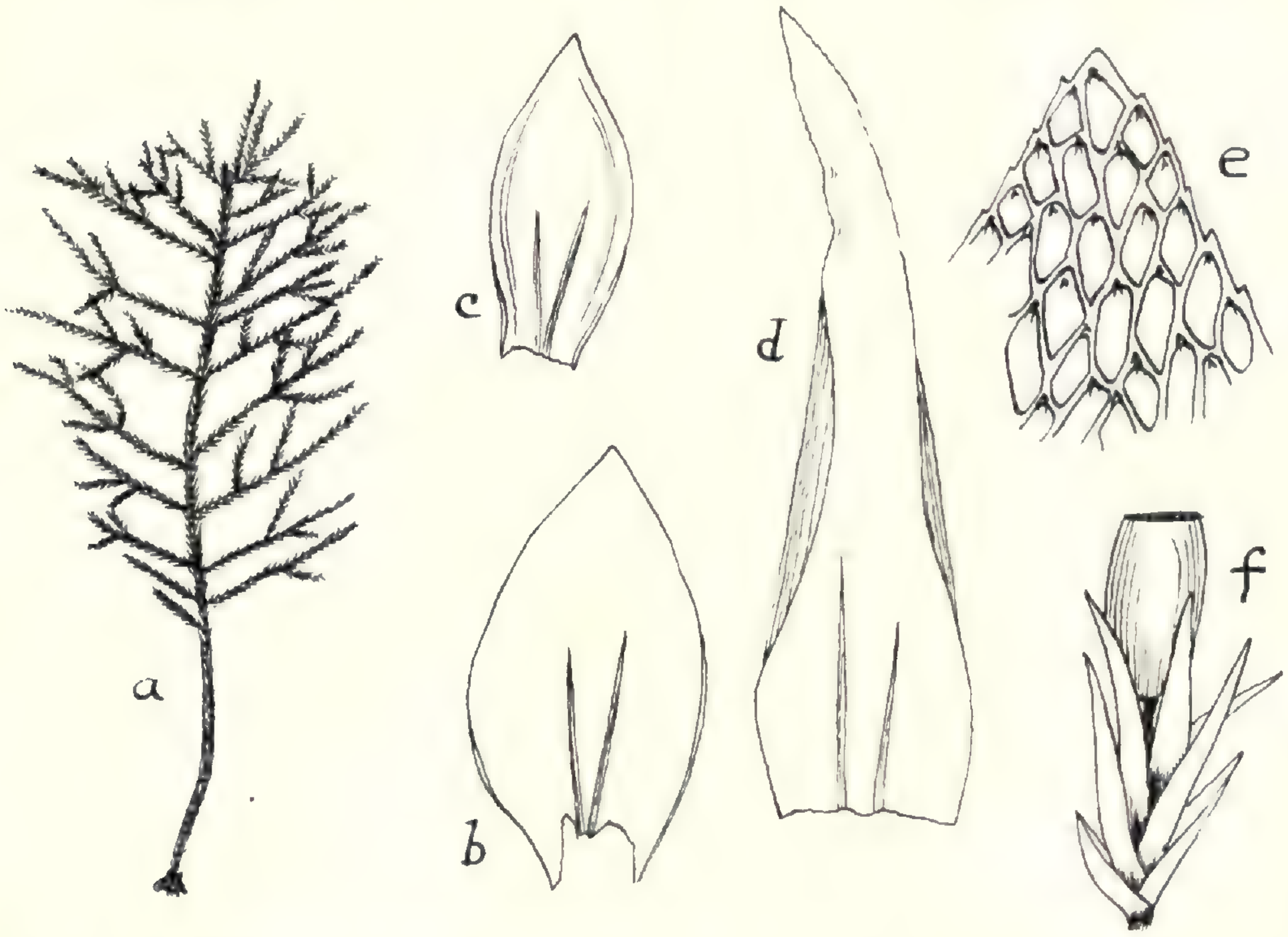

Fig. 1. PILOTRICHUM SPICULIFERUM, n. sp. *a*, plant, × 1; *b*, stem leaf, × 27; *c*, branch leaf, × 27; *d*, perichaetial leaf, × 27; *e*, apex of branch leaf, × 400; *f*, capsule and perichaetial leaves, × 10.

Dioicous. Male plants resembling the sporophyte bearing plants; flowers numerous along the upper part of the stem and the upper branches. Rather slender plants, dull brownish green. Secondary stems up to 7 cm. long, bipinnately branched, the branches rigid and blunt at the tips; stem leaves broadly ovate, acute, slightly concave, decurrent, 1.1 mm. long by 0.6 mm. wide; margins narrowly revolute below, erect above, denticulate all around; costae slightly divergent, attenuate, ending a little more than half way up, usually entirely smooth on the back and vanishing in the lamina but sometimes projecting in a very minute prickle; leaf cells about 5 μ wide by 2–3 times as long, linear-rhomboidal, with firm but scarcely incrassate walls, papillose on both sides over the upper end of the lumen with short, sharp spicule-like papillae; branch leaves slightly smaller, more deeply concave. Inner perichaetial leaves longer and narrower than the stem leaves, up to 2.2 mm. long, costae short and weak, cells

sharply papillose; seta short, 1.5–2 mm. long, erect or slightly curved; capsule ovoid, 1.5 mm. long, slightly exserted, the tips of the perichaetial leaves reaching about half way up the urn; calyptra sparsely pilose (capsules all too old or very immature); spores papillose, 18–20 μ in diameter.

TYPE: on tree trunk, Mocá, Dept. of Solola, Guatemala, April, 1931, *J. Bequaert* No. 68.

Resembling *P. cryphaeoides* Schp. but more slender and bipinnately branched. The costae are also consistently shorter, the leaf cells more sharply and densely papillose and the capsules barely exserted above the tips of the perichaetical leaves.

The smooth, attenuate costae ending in the lamina and not or scarcely tipped with a spine or tooth on the back is a peculiar character in this genus that is shared by only two other species with which I am familiar, namely: *P. cryphaeoides* Schp. and *P. mexicanum* Ther. The frondose habit as well as the larger, sharply papillose leaf cells and the minutely denticulate, rather than sharply serrulate, upper margins will at once separate it from *P. mexicanum.*

MICROTHAMNIUM LAXULUM Bartr. Mocá, on tree trunk, April, 1931.

Closely resembling the original collection from Costa Rica in habit and detail.

POLYTRICHUM ANTILLARUM Rich.

BUSHKILL, PENNSYLVANIA.

ANYCHIA CANADENSIS IN HAMPSHIRE COUNTY, MASSACHUSETTS.—For the past three or four years I have been interested in a colony of what I supposed might prove to be some member of the *Caryophyllaceae*, less than two dozen specimens by the side of a dirt road on the Holyoke Range in South Hadley, Massachusetts. Flowering specimens secured in 1933 were shown to Dr. Anderson of the Arnold Arboretum, who identified them as *Anychia canadensis* (L.) BSP.

So far as I can learn, this species has not been reported from Hampshire County. It has been collected nearby, however, in Franklin (Mt. Toby) and Hampden Counties. As far as my observation showed, the plant seemed to be restricted, in the locality found, to a narrow strip of tuffaceous earth, called Granby tuff (pH. 5.84) 1600 feet wide, extending lengthwise on the south side of the Holyoke Range. A few other isolated specimens have also been found near the Connecticut River on the southwestern edge of the Range; and here

again on Granby tuff. The plant is not found on the Triassic diabase talus-slopes nearby. The evidence seems to suggest that in this locality the species is restricted to the tuffaceous earth exclusively.

A specimen, checked by Prof. M. L. Fernald, has been filed in the Herbarium of the New England Botanical Club.—Albert L. Delisle, Biological Laboratories, Harvard University.

Epifagus virginiana (L.) Bart., forma **pallida**, n. f., planta omnino pallide brunnescens, nec rubro-tinctis, corollis albis supra pallidissime roseo-tinctis calicisque dentibus similiter tinctis exceptis.

Whole plant pale brownish, except for the white corollas very faintly tinged with dull pink above and the similarly tinged calyx-teeth.—Old beech and maple woods, Stratton, Vermont, *Una F. and C. A. Weatherby*, Sept. 3, 1933 (type, in Gray Herb.).

In the usual form of the species, the ground-color of stem and branches is much the same as in the form here proposed (nearly Ridgway's "tilleul buff"), but they are abundantly striate with narrow lines of brown madder.[1] The corolla is white laterally, with a broad stripe of brown madder extending its whole length above and a narrower stripe below. The calyx-teeth are also strongly tinted with the same color and the cleistogamous corollas and capsules spotted with it.

In f. *pallida* the madder pigment is wholly lacking except for a faint trace on the corolla above and on the calyx-teeth. It is quite analogous to *Corallorrhiza maculata*, f. *flavida* (Peck) Farwell, in which likewise a red pigment, normally present, is lacking and a yellow one, ordinarily masked by the red, gives the color to the plant.—C. A. Weatherby, Gray Herbarium.

An Additional Note on the Branching tendency in Polygonatum.—Since our publication of *Polygonatum pubescens* (Willd.) Pursh, forma *fultius* Fernald & Harris and discussion of similar forms of the European *P. multiflorum* (L.) All.,[2] Prof. J. A. Nieuwland has called our attention to *P. commutatum* (R. & S.) Dietr., forma *ramosum* McGivney.[3] This plant, found in the vicinity of Notre Dame, Indiana and near Lake Christiana, Michigan, is even more branching than our form of *P. pubescens*. Prof. Nieuwland writes that the

[1] I here follow the careful color nomenclature of Schuyler Mathews's Field Book of American Wild Flowers.

[2] M. L. Fernald and S. K. Harris, Rhodora, xxxv. 403–406 (1933).

[3] Sister Vincent De Paul McGivney, Am. Midland Nat. ix. 663, 664 (1925).

flowers of *P. commutatum*, forma *ramosum* are perfect and that the plants set seed every year, thus differing from the forms of *P. multiflorum* and from what appears to be the case in *P. pubescens*, forma *fultius*. No indication is given in the description of the form that it was found growing in a locality which had recently been disturbed.—M. L. Fernald and S. K. Harris, Gray Herbarium.

Moss Flora of North America.[1] Another part (*Grimmiaceae*) of Grout's Moss Flora has appeared. The text is almost entirely the work of Mr. Jones although Dr. Grout has edited it and contributed an "Artificial Key to the Grimmiaceae." Eight genera are described: *Glyphomitrium* with 1 species, *Grimmia* with 47 species and 22 varieties and forms, *Scouleria* with 2 species, *Braunia* with 2 species, *Hedwigia* with 1 species and 5 forms, *Campylostelium* with 1 species, *Ptychomitrium* with 5 species, and *Rhacomitrium* with 9 species and 9 varieties and forms. There are 25 excellent plates figuring about 63 species and varieties. As in earlier parts most of these illustrations are reproduced from many different sources: e. g., Bryologia Europaea, The Bryologist, Sullivant, Engler and Prantl, Bulletin of the Torrey Botanical Club, Braithwaite, etc. There are 7 original illustrations by Mr. Seville Flowers and 1 by Miss E. L. Curtis. Seven species apparently have never previously been illustrated: these are, *Glyphomitrium canadense*, *Grimmia atricha*, *G. coloradensis*, *G. hamulosa*, *G. heterophylla*, *G. Moxleyi*, and *Ptychomitrium Gardneri*. About a dozen species figured in Grout's "Mosses with Hand-lens and Microscope" are not here re-illustrated. There are several new combinations and one description of a new form—*Grimmia alpicola* var. *rivularis* f. *papillosa*. A minor criticism is the lack of uniformity in the use of italics in listing "Exsiccati." Text and plates are of the same high grade as in all earlier parts. The publication is indispensable to active students of North American Grimmiaceae.—J. F. C.

[1] *Moss Flora of North America, north of Mexico. Grimmiaceae* by George Neville Jones, M.Sc., edited by A. J. Grout, Ph.D. Vol. II, pt. 1, pp. 1–65, plates I–XXV. Published by A. J. Grout, Newfane, Vt., Nov., 1933.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CIII.

REALIGNMENTS IN THE GENUS PANICUM

M. L. Fernald

No large genus of the *Monocotyledoneae* in eastern North America can compare for difficulty of satisfactory classification with *Panicum;* and within the genus by far the most baffling aggregation is that strictly North American series which has been designated as the subgenus *Dichanthelium* Hitchc. & Chase, the heteromorphous series often called the *Dichotomum*-group, from *P. dichotomum* L., the type of the subgenus, to which at one time or another most of the species with small spikelets have been referred. After Linnaeus, the earlier systematists, mostly with conservative or orthodox conceptions of specific values, proposed, within this dominant Atlantic American group, a fair number of unquestioned species: *P. depauperatum* Muhl., *laxiflorum* Lam., *ciliatum* Ell., *strigosum* Muhl., *aciculare* Desf., *consanguineum* Kunth, *angustifolium* Ell., *microcarpon* Muhl., *spretum* Schultes, *lanuginosum* Ell., *ovale* Ell., *sphaerocarpon* Ell., *polyanthes* Schultes, *tenue* Muhl., *ensifolium* Baldw., *chamaelonche* Trin., *lancearium* Trin. and *commutatum* Schultes, and several with larger spikelets. With these well attested names to shuffle, the next two or more generations were mostly content to leave well enough alone and to recognize something as probably meant by these and some other names (now ranked as synonyms) of the same post-Linnean period.

Then, with more intensive exploration, especially of the Coastal Plain, where *Panicum,* subg. *Dichanthelium* is dominant, Scribner, of

a conservative school, or Scribner and his associates proposed a few of our best-marked species: *P. linearifolium, ovinum, Wrightianum, Thurowii, columbianum* and *equilaterale*. There was, furthermore, no balking at the reduction of intergradient plants to varietal rank or to complete synonymy: *P. Ashei* reduced to *P. commutatum*, *P. tennesseense* to *P. lanuginosum*, and *P. patulum* treated as a variety of *P. lancearium* (as *P. Nashianum patulum*). Then, with the ultra-democratic or radical reaction against orthodoxy and good usage which found expression in such gems as "Asa Gray didn't know where he was at!" and "Now the day of authority is ended," *Panicum* suddenly became a favorite source of proposed new species, especially by younger men with little or no background of general scholarship and with a minimum of experience in exact and judicious consideration of other groups, whose specific evaluations were of a conveniently mechanical uniformity not consistent with the behavior of plants in Nature. For several years Ashe and Nash held the field. The recognition of such species of the former as *P. calliphyllum, annulum, mattamuskeetense, yadkinense, roanokense, lucidum, meridionale* and *subvillosum* definitely clarifies our understanding of the group; but such remarkable names of Ashe as *P. arenicolum, filiramum, Cahooni-anum, huachucae, orangensis, shallotte, parvipaniculatum* and *glabris-simum* can, fortunately, be forgotten in synonymy. Similarly, our understanding of the genus is greatly helped by the recognition of Nash's *P. perlongum, boreale, leucothrix, villosissimum* and *malaco-phyllum;* but there is little intellectual or taxonomic satisfaction in attempting to keep apart as species his *P. Clutei, paucipilum, at-lanticum* and *tsugetorum.*

American botanists have to thank Hitchcock & Chase for their very exacting and remarkably complete study of the genus which appeared in 1910 as *The North American Species of Panicum.*[1] The making of the very detailed keys alone must have required months of work; the trailing of types and the careful drawing of their spike-lets, with critical notes upon the type-specimens, are, surely, the result of years of careful research; furthermore, the very illuminating discussions after the descriptions aid tremendously in the inter-pretation of the specific concepts maintained. For all these features every close student of our flora must be grateful. It would, con-sequently, be most gratifying if the evaluations of species in the book

[1] Contrib. U. S. Nat. Herb. xv. (1910).

could all be accepted as they stand. But a close study of the work shows that two quite different groups of plants are accepted as species: 1st, the entities with sharply defined and constant or essentially constant characters in inflorescences or spikelets: *P. flexile, Gattingeri, virgatum, verrucosum, consanguineum, fusiforme, boreale, caerulescens, praecocius, thermale, sphaerocarpon, polyanthes, ensifolium, chamaelonche, Wilcoxianum, malacophyllum, Leibergii, xanthophysum, scoparium, scabriusculum, clandestinum, latifolium* and *Boscii;* and 2d, a large series of plants which are separated as "species" on "more or less" differences of an inconstant nature. Illustrative of this second group are many plants which the older systematists would unquestionably have treated as variations of other species and which a gratifyingly large group of students today would still so treat: *P. capillare* and *barbipulvinatum; P. longifolium* and *Combsii; P. anceps* and *rhizomatum; P. linearifolium* and *Werneri, P. laxiflorum* and *xalapense; P. mattamuskeetense* and *Clutei; P. dichotomum* and *barbulatum; P. meridionale* and *albemarlense; P. Lindheimeri* and *implicatum, huachucae, tennesseense, lanuginosum* and *languidum,* with essentially identical spikelets and 1st glumes; *P. villosissimum, pseudopubescens* and *scoparioides; P. Commonsianum* and *Addisonii; P. tsugetorum* and *columbianum; P. lanceariun* and *patulum; P. Helleri, Scribnerianum* and *oligosanthes; P. Ashei, commutatum* and *Joorii*

In some cases active field-botanists have already protested the separation as species of members of some of these twins, triplets or sextets. Thus, in his scholarly *Plants of Southern New Jersey,* Dr. Witmer Stone speaks of "*P. albemarlense,* a species which so far as New Jersey material goes I find it impossible to separate from *P. meridionale,*"[1] and also says "So many New Jersey specimens are regarded as intermediate between *commonsianum* and *addisonii* by Hitchcock and Chase, to whom they were submitted, that it seems more reasonable to regard them as subspecies rather than as full species."[2] Wiegand & Eames, in their *Flora of the Cayuga Lake Basin,* feel that *P. tsugetorum* is "Perhaps only varietally distinct from *P. heterophyllum* [*P. columbianum*]"[3]; personally I can't get even a variety out of it. In 1929 the acute taxonomist of Indiana, C. C. Deam, in the main faithfully accepting the specific evaluations

[1] Stone, Pl. So. N. J. 203 (1910).
[2] Stone, l. c. 206 (1910).
[3] Wiegand & Eames, Fl. Cayuga L. Basin, 89 (1926).

of Hitchcock & Chase, occasionally showed a wholesome independence. "Our Indiana specimens show some variation and some have been named for me as *Panicum barbulatum* Michx. This species is separated from *Panicum dichotomum* L. by its more pubescent nodes, ... I have studied our species carefully and I believe a division of them is not warranted."[1] Of *P. tennesseense* he said: "I think all of my specimens could be safely referred to *Panicum huachucae*, regarding them as a glabrous form of that species";[2] and he specially noted his difficulty in separating *P. tsugetorum* from *P. columbianum* and *P. Ashei* from *P. commutatum*.

In the same year Weatherby, Knowlton & Bean expressed a widespread feeling in regard to the group:

> As to *Panicum*, we are inclined heartily to second the remark of Professors Wiegand and Eames (Cornell Univ. Agric. Exp. Sta. Mem. xcii. 83 (1926), that "the separation of species . . . on the basis of degree of pubescence is to be regretted." Hitchcock and Chase have rendered invaluable service in patiently tracking down the types of all such proposed species and definitely placing them in a taxonomic scheme. Many of them they have reduced to synonymy. After a long pursuit of vanishing "characters" through a maze of slightly differing herbarium specimens, we suspect that the reduction might profitably be carried further. Are there any real specific lines between *P. columbianum*, *P. tsugetorum*, and *P. subvillosum; P. meridionale* and *P. albemarlense?* Where does *P. columbianum*, var. *thinium* leave off and *P. meridionale* begin? Was Bicknell, a keen observer and by no means averse to recognizing close species, right in reducing *P. oricola* to *P. meridionale* and in maintaining *P. Owenae;* or are Hitchcock and Chase, fortified by long monographic study of the genus, correct in reducing *P. Owenae* and retaining *P. oricola?*
>
> Such questions we have, for the most part, been unable to answer satisfactorily; we have, as the most practicable method, here maintained, at least as varieties, nearly all the species recognized in recent treatments, so far as we are able to make them out in the material at hand. We have, however, accepted with a good deal of relief Prof. Fernald's telescoping of *P. Lindheimeri*, *P. huachucae*, etc., into a single species. This arrangement gives, in New England, natural ranges; and it is conducive to ease in naming specimens, a quality which should appeal strongly to anyone condemned to struggle with this group. We have followed Dr. Hitchcock's earlier reduction of *P. Clutei* to synonymy under *P. mattamuskeetense* in preference to his later re-separation of the two. *P. oligosanthes* we have omitted altogether. Material of it from the southeastern states is at least varietally distinct from *P. Scribnerianum*, and the latter may stand as a species, as species go in *Panicum;* but the New England collections referred to *P. oligosanthes* appear to us to represent only slender states of *P. Scribnerianum*. New England reports of *P. lucidum* seem also to be erroneous.[3]

[1] Deam, Grasses of Indiana, 265 (1929).
[2] Deam, l. c. 275 (1929).
[3] Weatherby, Knowlton & Bean, Rhodora, xxxi. 107 (1927).

Still more recently, Weatherby & Griscom, reporting on their field-experiences in South Carolina, found, as others have before them, the greatest confusion of the characters relied upon by Hitchcock & Chase to separate *Panicum xalapense* from *P. laxiflorum* and concluded: "it appears to us . . . . that *P. xalapense* is doubtfully separable."[1]

Somewhat earlier, as a result of attempting of understand certain tangled ("implicated") groups in *Panicum*, I had "telescoped" some of the entities which Hitchcock & Chase accept as true species: *P. barbipulvinatum* reinstated as a variety, *P. capillare*, var. *occidentale* Rydb.[2] (Surely, if Rydberg could see in it only a variety, its specific status might well be open to doubt); *P. Werneri* placed under *P. linearifolium* as a glabrous variety;[3] and *P. Lindheimeri, huachucae, tennesseense, implicatum* and *languidum* treated as a hopelessly intergradient series of variations.[4] This treatment has found reflection in the work of several later students and in writing of the group in 1930 Dr. J. M. Fogg, Jr., noted specimens of what seemed to him one plant as identified for him, some as *P. implicatum*, some as *P. huachucae*, some as *P. huachucae*, var. *silvicola;* and he stated that in his judgment "there is a well marked *meridionale* extreme and an equally characteristic *oricola* one, but between them an almost complete series of intergradations."[5]

More recently, trying again to gain a clear conception of the genus in northeastern America, I have found myself wholly in accord with the conservative views of Stone, Wiegand & Eames, Deam, Weatherby, Knowlton & Bean and Weatherby & Griscom and other field-botanists who have written me of their judgments; and I have accepted as a duty the quite unwelcome task of realigning several members of the genus, as discussed in the succeeding pages. In most of these cases, it will be noted, it is necessary only to study the very illuminating comments of Hitchcock & Chase in order to detect the confluent plants, the groups of variations which I have designated as the 2d series which they recognize as true species.

The recognition of mere tendencies or variations in response to edaphic or ecological conditions as species is too common but it completely obscures one of the most important and far-reaching laws

[1] Weatherby & Griscom, Rhodora, xxxvi. 35 (1934).
[2] See Fernald, Rhodora, xxi. 111 (1919).
[3] Fernald, Rhodora, xxiii. 194 (1921).
[4] Fernald, l. c. 141 and 223–228 (1921).
[5] Fogg, Rhodora, xxxii. 233 (1930).

of evolution, which should be at the bottom of all sound taxonomy; and, in view of the great need of scholarly and thoroughly trained taxonomists, so much emphasized in several public meetings in recent years, such a standard of values can hardly prove convincing to the really earnest and thoughtful young students whom we wish to enlist. Fortunately, they are still idealists and they are naturally attracted to the fields in which scholarly thoroughness is evident. When a plant or a series of specimens has no definite and constant character of the reproductive (conservative) structures, but differs only in having thinner or thicker leaves, weaker or stiffer culms, greater or less development of pubescence, or greener or more purple foliage, it is safe, judging from common experience of many good field-observers, to look to differences of habitat (of shade and sunshine, of chemical reactions of the soil or of moisture and aridity) as largely controlling these simple responses. Nevertheless, upon just such ecological responses somewhat intensified and upon little or no difference in the shape of spikelet or of its 1st glume have *P. languidum* and *P tennesseense* been separated from *P. huachucae* and *P. Lindheimeri*, *P. albemarlense* from *P. meridionale*, *P. pseudopubescens* and *P. scoparioides* from *P. villosissimum*, *P. patulum* from *P. lanceariu*m and *P. Joorii* from *P. commutatum*.

The recognition of such tendencies as true species and the illogical disinclination to call them varieties (or merely forms or states in some cases) has had many advocates. One of the most consistent defenders of as yet not sharply differeniated plants as "species" was the late Dr. Rydberg. So consistent was Rydberg's attitude on this point, that it is almost startling to find an occasional variety designated by him.[1] Rydberg's philosophy, clearly expressed, was stated to the International Congress of Plant Societies at Ithaca:

> Until we have discovered and described all, or most, of the great number of yet unknown forms, and until the species have been tested by cultivation, breeding, changing of soil environment, etc., they naturally have to remain tentative. I leave it to others to find out whether the characters, prominent or trifling as they may be, on which they are based, are constant enough to place them as distinct species. I think that I have done a service to taxonomy if I have pointed out existing characters. I also think that a form that is worth describing, also should have a name.

[1] Some years ago I chanced to overhear a bit of conversation at the Gray Herbarium, which others should enjoy. Miss Alice Eastwood was catechizing Rydberg regarding one of his segregations, which he defended as necessary in order that he should be consistent. Miss Eastwood retorted, "Hang consistency!", to which came the rejoiner in Rydberg's high-pitched voice: "Some folks would call that female."

I prefer a binomial. When I use a binomial I do not pretend that it means the same as a species in Hall-Clements style. I do not pretend to be able to pass on its rank, because in most cases it is impossible.[1]

Somewhat earlier Rydberg had expressed his view of species in these words: "My intention is not to defend them [his own segregates] as species. The limitation between species and variety will always be arbitrary, so also between variety and form [therefore call every recognizable trend a "species"!]. . . . What he [Fernald] and many others call varieties, I call species."[2] Some others with the same philosophy are readily recalled and the defenders of many of the "redundant"[3] Panicums can hardly be called conservative.

Nevertheless, although in some cases, especially of plants described from scrappy bits of specimens otherwise quite unknown to the phytographer, the constancy of characters cannot always be confidently asserted, it certainly cannot be rightly maintained that an experienced and careful taxonomist, after many years of study of plants in the field and in the herbarium, can "not pretend to be able to pass on its rank," and that "in most cases it is impossible." Surely, when the common experience of really careful and thoughtful observers and the large accumulation of specimens in our greater herbaria shows a plant essentially invariable in its fundamental reproductive characters, it is quite possible (even simple) to note its vast difference from a series which lacks stability in the same characters. Many justly honored taxonomists have clearly comprehended that there are such differences; and the differentiation between true or stable species, on the one hand, as opposed to inconstant or unstable ones, on the other, is absolutely necessary if taxonomy is to hold its honored place in science. It is almost a truism that "conservative" and essentially unvarying species characterize the more ancient floras and faunas—the relic species persisting from the earlier geological epochs in the evolution of plants and animals. It is equally a truism, that in recently disturbed or altered areas a stimulation and multiplication of variations has occurred and that under such conditions inconstant and plastic species luxuriate. The members of *Panicum*, subg. *Dichanthelium* have their greatest development on the relatively youthful Atlantic coastal plain of North America, and the subgenus shows its youth, in the first place, by its

[1] Rydb. in Proc. Intern. Congr. Pl. Sci. ii. 1544, 1545 (1929).
[2] Rydb. Bull. Torr. Cl. xxxviii. 352–354 (1911).
[3] See Rhodora, xxiii. 141 (1921).

multiplication of variations and its aggressiveness, in the second, by its restriction to North America, with most of its species on or near the geologically young coastal plain.

The relative youth of *Panicum* subg. *Dichanthelium* is strikingly contrasted with the great age of some other members of the *Paniceae*. *Valota*, for instance, is a small genus (about 12 species) sharing warm parts of America with Australia; and *Leptoloma* has one very uniform species in North America, the other three in Australia. Since Australia was cut off from its connection with the other continents by mid-Cretaceous time, it follows that *Valota* and *Leptoloma* have had a tremendously long existence; their species are few and stable. *Panicum*, subg. *Dichanthelium*, restricted to North America, where it is chiefly developed in the most youthful regions, and without representation in the ancient flora of Australia, is, by inference at least, a more youthful group. Its behavior certainly so indicates. Is it not significant, therefore, that this group should contain so many poorly differentiated, so-called "species"? Failure to recognize that they belong to a different class from the stable and ancient species obscures one of the most illuminating demonstrations of evolution we have in our living flora.

After Rydberg had expressed at Ithaca his inability to judge the validity of his own generic and specific segregations, Dr. Skottsberg made a trenchant and very sound reply. His telling examples and direct refutation of the weak attitude of the extreme "splitter," especially of genera, should be carefully studied by all who are not beyond redemption. It is impossible here to republish his complete rejoinder, but I may be pardoned for passing on certain pregnant passages, even though they deal primarily with generic, rather than specific, segregation. The principles involved are equally applicable to the segregation of confluent "species."

> What do we gain by splitting? In some cases, in many perhaps, the operation is necessary. If we find a black sheep hidden in an otherwise natural genus, small or large, drive it out, of course, and make a new genus for it, if this be necessary. Nobody will fail to give you credit for that. . . . But apart from such instances, what can the reason be for these almost convulsive efforts to segregate everywhere? Some people say there is a good deal of personal vanity at the bottom of it, but that I refuse to believe. A serious taxonomist will do no such thing. No, as Dr. Rydberg told us in his paper: when a genus becomes "too large" it is time to split it up so that we may get a better oversight over it. I cannot see the point there. As if a large genus would become easier to handle only because we call its sections genera? Have we really got a

better and clearer idea of the genus *Cereus* after Britton and Rose cut it up into 75 pieces? Those who think so, deceive themselves. We get lots of new names to remember and scores of new synonyms to keep a record of, that is about all—we do not gain a single thing by making genera sub-tribes and sections genera, but we lose a great deal. We lose the firm hold on good natural groups, we lose useful and pleasing associations of minds, more so if we put, as is done so often now, equal weight on vegetative as on floral characters. We efface interesting facts regarding geographical distribution. I think it is quite fascinating to observe how a genus like *Viola*, a very natural genus indeed, has developed, under different conditions, . . . Split up this genus, and that wonderful display of life-forms passes out of sight. Had the Hawaiian species grown in Oregon and the Andean in the Rocky Mountains they would not have been violets any more. For if the genus *Pinus* is split, anything may happen.

Suppose we have a natural genus (taken in a wide, conservative sense) that has developed one section in Europe, another in Asia, a third in America, showing characters that give us certain hints as to the early history of the genus and at the same time so well separated from each other that the splitter has a fair chance to set to work, will it not appear to us that we know, as it were, less about the three new genera than about the single old one unless we are able always to remember that, once upon a time, the three used to be one?

. . . . . .

The limitation of genera is a matter of both good knowledge—and of the whole assemblage, not only of the species in one section of the area—and good taste. . . .

It would be well if those who are less keen on changes for changes' own sake would join in an appeal to those who believe that change in taxonomy always means development, asking them, before they spoil a good old genus, to stop and ask themselves: what does botany gain? Are not, after all, these new genera like rockets, rising with brilliancy only to slump down and fall into oblivion, increasing the burden of synonyms that all of us curse?[1]

As already stated, the conservative viewpoint, so well expressed by Skottsberg regarding genera, applies equally well to species. The inordinate segregation of species without sharp differentiations truly "effaces interesting facts."

PANICUM LONGIFOLIUM Torr., var. **Combsii** (Scribn. & Ball), comb. nov. *P. combsii* Scribn. & Ball, U. S. Dept. Agr. Div. Agrost. Bull. no. 24: 42, fig. 16 (1901).

P. LONGIFOLIUM, var. **pubescens** (Vasey), comb. nov. *P. anceps*, var. *pubescens* Vasey, U. S. Dept. Agr. Div. Bot. Bull. no. 8: 37 (1889).

Panicum longifolium Torr., originally described from New Jersey, has four usually well-defined but clearly confluent geographic varieties: var. *tusketense* Fern., RHODORA xxiii. 192 (1921), known only

[1] Skottsberg, Proc. Internat. Congr. Pl. Sci. ii. 1554, 1555 (1929).

from the valley of the Tusket River in Nova Scotia; typical *P. longifolium*, following the Coastal Plain from southeastern Massachusetts to Florida; var. *Combsii*, extending from southern Georgia and northern Florida to Louisiana; and var. *pubescens* occurring, likewise, from Florida to Louisiana. The diagnostic characters of the four varieties follow.

a. Plants 2–9 dm. high; culms 1–3 mm. broad at the 1st exposed node; principal sheaths 0.5–1.5 dm. long, 15–40-nerved at summit, glabrous (exceptionally villous); longer blades 1–3.5 dm. long, 3–6 mm. broad, glabrous (exceptionally villous); larger panicles 0.3–2.3 dm. long, 0.1–1.5 dm. broad. ....*b.*

b. Branches and branchlets of panicle ascending, the mature branchlets appressed or subappressed.

Spikelets 2–3 mm. long, the 2nd glume equaling or longer than the sterile lemma; longer branches of panicle 3–14 cm. long.....*P. longifolium* (typical).

Spikelets 2.6–3.4 mm. long, the 2nd glume usually shorter than the sterile lemma; longer branches of panicle 0.1–8 cm. long.....Var. *tusketense.*

b. Branches and branchlets of mature panicle strongly (often horizontally) divergent; spikelets 3–4 mm. long, with tips often sharper; 2nd glume equaling or slightly exceeding the sterile lemma; longer branches of panicle 5–10 cm. long.....Var. *Combsii.*

a. Plants 8–10 dm. high; culms 3–6 mm. broad at the 1st exposed node; principal sheaths 1–2.5 dm. long, 25–50-nerved at summit, usually densely villous; longer blades 3–7 dm. long, often overtopping the panicle, 5–8 mm. broad, usually villous; larger panicles 2–4 dm. long, 1–2 dm. broad, in maturity with horizontally divergent branches and branchlets; spikelets 2–2.5 mm. long.....Var. *pubescens.*

Typical *P. longifolium*, described by Torrey from "the pine barrens of New Jersey," with "*Culm* about 2 feet high . . . . *Sheaths* . . . somewhat hairy at the throat" but otherwise the "whole plant very smooth," the "*Panicle* with few appressed branches," is the only variation of the species found north of Georgia, except for the superficially similar but isolated Nova Scotian var. *tusketense*. On the basis of pubescence of foliage (a most fickle vegetative character) the 51 sheets before me of typical *P. longifolium* and var. *tusketense* fall into the following grouping.

Foliage strictly glabrous (except for ligule), 41: Nova Scotia, 12; Massachusetts, 4; Rhode Island, 7; Connecticut, 7; New Jersey, 5; Maryland, 2; Georgia, 1; Florida, 3.

Sparse villosity on 1 or more sheaths or blades, 9: Connecticut, 1; New Jersey, 4; Delaware, 1; Virginia, 1; Georgia, 1; Florida, 1.

Abundant and conspicuous villosity on sheaths and blades, 1: Delaware, 1.

From these figures it is clear that typical *Panicum longifolium* is an

essentially glabrous plant, "whole plant very smooth," to use Torrey's diagnostic phrase. Consequently, in vainly attempting to find the specific lines which separate from it *P. Combsii*, it is at least not reassuring to find them stated by Hitchcock & Chase as follows:

> This species [*P. Combsii*] is closely related to *P. longifolium* from which it may be distinguished by its shorter blades, longer spikelets, and usually by the lack of pubescence.

In their key Hitchcock & Chase (N. Am. Pan., Contrib. U. S. Nat. Herb. xv. 99) group *P. longifolium* and *P. Combsii* under the call:

Ligules ciliate; basal leaves half as long as culm or more; panicle much exceeding the upper leaves.

Certainly it is most difficult to detect any constant difference in the foliage of the two. We then hopefully turn to the stated diagnostic characters:

Spikelets not over 2.7 mm., usually 2.5 mm. long, the first glume less than half that length; ligules 2 to 3 mm. long. . 53. *P. longifolium.*
Spikelets 3 to 3.5 mm. long; first glume two-thirds to three-fourths that length; ligule less than 1 mm. long . . . . . 54. *P. combsii.*

In the original diagnosis of *P. Combsii*, Scribner & Ball, likewise, described the "first glume . . . two-thirds to three-fourths the length of the spikelet"; but their illustration of the plant might well have been drawn from a New Jersey, New England or Nova Scotian specimen of *P. longifolium*, for the artist showed the first glume only two-thirds the length of the spikelet, a proportion not difficult to find in specimens of *P. longifolium* all the way north to Nova Scotia. I have carefully measured characteristic spikelets and their first glumes in all three series with the result shown in the accompanying table.

	Typical P. LONGIFOLIUM	1st Glume.	Spikelet.	Proportion (per cent)
Marion, Massachusetts,	*Fernald*, no. 783	1.7 mm.	2.8 mm.	.53
Dartmouth, Massachusetts,	*Eaton & Griscom*	2	3	.66
Pasque I., Massachusetts,	*Fogg*, no. 3787	1.9	3	.63
Hopkinton, Rhode Island,	*Collins & Fernald*, no. 11,245	1.5	3	.50
Lake Worden, Rhode Island,	*Faxon*	1.8	3	.60
Westerly, Rhode Island,	*Ware et al.*	1.9	3	.63
Richmond, Rhode Island,	*Fernald & Collins*	1.7	3	.57
Killingworth, Connecticut,	*Weatherby*, no. 3763	1.4	3	.37
Killingworth, Connecticut,	*Weatherby*, no. 2514	1.8	3	.60
Groton, Connecticut,	*Graves*, no. 256	1.5	2.7	.55
Groton, Connecticut,	*Woodward*	1.6	3	.53
Southington, Connecticut,	*Bissell*, no. 5529	1	2	.50
Long Branch, New Jersey,	*Wm. Boott*	2	3	.66
Burlington Co., New Jersey,	*Parker*	1.7	2.8	.60
Pine Barrens, New Jersey,	*A. Gray*	1.5	2.8	.53

	Typical P. LONGIFOLIUM	1st Glume.	Spikelet.	Proportion (per cent)
Cold Spring, New Jersey,	*Gershoy*, no. 52	1.2	2.4	.50
New Lisbon, New Jersey,	*MacElwee*	1.2	2.4	.50
Rehoboth, Delaware,	*Churchill*	1.5	2.5	.60
Talleyville, Delaware,	*Commons*	1.6	2.6	.58
Clinton, Maryland,	*Holm*	2	3	.66
Cape Henry, Virginia,	*Am. Gr. Nat. Herb.*, no. 50	1.8	2.8	.64
Sumter Co., Georgia,	*Harper*, no. 1081	2	3	.66
Gainesville, Florida,	*Am. Gr. Nat. Herb.*, no. 51	1.2	2	.60

Range of 1st Glume: 37–66 (av. 58) per cent. of length of Spikelet.

Var. TUSKETENSE

Kemptville, Nova Scotia,	*Fernald & Long*, no. 23,191	1.8	2.9	.63
Gilfilling L., Nova Scotia,	*Fernald & Long*, no. 23,190	2	3	.66
Butler's L., Nova Scotia,	*Fernald et al.*, no. 19,763	1.8	3.2	.56
Pearl L., Nova Scotia,	*Fernald & Linder*, no. 19,761	1.6	2.6	.58
Tusket R., Nova Scotia,	*Fernald et al.*, no. 19,765	1.7	3	.57
Tusket L., Nova Scotia,	*Fernald et al.*, no. 19,759	1.5	2.8	.53
Butler's L., Nova Scotia,	*Fernald et al.*, no. 19,764	1.8	3	.60

Range of 1st Glume: 53–66 (av. 60) per cent. of length of Spikelet.

Var. COMBSII

Coffee Co., Georgia,	*Harper*, no. 2014	2.1	3.5	.60
Berrien Co., Georgia,	*Harper*, no. 1679	2	2.8	.71
Chipley, Florida,	*Combs*, no. 583 (COTYPE)	2–2.2	3	.66–.73
Pensacola, Florida,	*Curtiss*, no. 6919	2.5	4	.63
Gateswood, Alabama,	*Tracy*, no. 8408	2.2	3.5	.63
New Orleans, Louisiana,		2	3.6	.55

Range of 1st Glume: 55–73 (av. 64) per cent. of length of Spikelet.

These measurements distinctly show the futility of attempting the separation of *Panicum Combsii* as a species distinct from *P. longifolium* because the former has the "Spikelets 3 to 3.5 mm. long; first glume two-thirds to three-fourths that length," while the latter has "Spikelets not over 2.7 mm., usually 2.5 mm. long, the first glume less than half that length." Of the comparatively few sheets seen of *P. Combsii*, 1 has the spikelets less than 3 (2.8) mm. long and only 2 have the glumes of the required length, the remaining sheets showing them well under two-thirds, and in one case only slightly more than one-half the length of the spikelets. All these sheets were labelled by Hitchcock & Chase *P. Combsii*.

In true *P. longifolium*, furthermore, it is a somewhat exceptional specimen which has the spikelets "not over 2.7 mm., usually 2.5 mm. long." Of the 23 measured (because well developed) 16 have spikelets longer, 2.8–3 mm., the latter measurement being most frequent. As to the length of the 1st glume, it is significant that in only a single

collection have I found the 1st glume "less than half" the length of the spikelet, while in several cases it reaches the reputed "two-thirds . . . that length" of *P. Combsii*. In the most northern extreme, *P. longifolium*, var. *tusketense*, furthermore, the spikelets stand midway in length between those of the very southern var. *Combsii* and of the geographically intermediate typical *P. longifolium*, while the glumes of the northernmost extreme average three-fifths as long as the spikelets.

Similarly with the reputed difference in the ligule. Harper's no. 1679 from Berrien County, Georgia, is cited (from Tifton) by Hitchcock & Chase as *P. Combsii* and the specimen in the Gray Herbarium so labelled by them has very orthodox glumes (71 per cent. the length of spikelet) but it is heterodox in having spikelets only 2.8 mm. long; and its ligules, which in *P. Combsii* should be "less than 1 mm. long," wholly break the bounds by measuring 3.5 mm. in length! On the contrary, in much northern material, for example *Graves*, no. 256, from Groton, Connecticut, cited as *P. longifolium* by Hitchcock & Chase, it is easy to find ligules not more than 1.5 mm. long.

Although breaking down as a species, *Panicum Combsii* may be maintained as a geographic variety. Its glumes and sterile lemma are more attenuate at tip than in the other varieties and its mature panicle, as shown by the cotype and other mature specimens, has more horizontal branches and branchlets than in true *P. longifolium* and var. *tusketense*. In its more divaricate branching var. *Combsii* simulates the coarser southern plant, var. *pubescens*. That variety, however, has relatively small spikelets, and its very long leaves, as beautifully exemplified in *Tracy*, no. 6507a, may greatly overtop the panicles.

PANICUM ANCEPS Michx., var. **rhizomatum** (Hitchc. & Chase), comb. nov. *P. rhizomatum* Hitchc. & Chase, Contr. U. S. Nat. Herb. xv. 109, fig. 104 (1910).

Only by those who recognize species which are confluent and which are separated solely on "more or less" difference in size and habit, without technical morphological characters, can *Panicum rhizomatum* be maintained as a species. Its leading diagnostic characters, as given by its authors, are found in their key:

Panicle open; spikelets 3.4 to 3.8 mm. long (shorter in exceptional specimens) . . . . . 55. *P. anceps.*
Panicle more or less contracted; spikelets not over 2.8 mm. long. 56. *P. rhizomatum.*

In their fuller discussion of *Panicum anceps* they note that the "open" panicle may be "occasionally narrower" or with "branchlets . . . approximate, producing densely flowered branches," while in *P. rhizomatum* "In occasional specimens the panicle is rather open but less so than in *P. anceps;* but the following three specimens, having all the characters of *P. rhizomatum*, have panicles as open as those of *P. anceps*, the small spikelets secund as in that species, and appear to be intermediates." There is sufficient evidence that they *are* intermediates. In spite of the spikelets of *P. anceps* being defined as "3.4 to 3.8 mm. long," there are "occasional specimens with smaller spikelets; . . . only 3 to 3.2 mm. long. Such . . . being nearly glabrous plants with open panicles, are referred here, though in the smaller spikelets they approach the next species [*P. rhizomatum*]."

If additional evidence were needed that *P. rhizomatum* is only a variation of *P. anceps*, it appears in sheets sent out from the National Herbarium to illustrate the two. The plant from Maryland, Amer. Gr. Nat. Herb. no. 54, distributed as *P. anceps*, "As described by Hitchcock & Chase," therefore conforming to their conception of the species, has the fully mature panicle of the same breadth but with slightly more ascending branches (less open panicle) than the mature panicle of their no. 56, distributed as an authentic representative of *P. rhizomatum.* In no. 54 the spikelets are only 3–3.2 mm. long, while the mature panicle of no. 56 displays some still persistent spikelets 3 mm. long. Again, compare *Curtiss*, no. 5747 and Biltmore Herb. no. 696[b] from Florida. The former is cited in *The North American Species of Panicum* as good *P. rhizomatum* and from its freely developed rhizomes and small spikelets is a good illustration of that plant. The latter (696[b]) is cited without question as *P. anceps* ("spikelets 3.4 to 3.8 mm. long"). Nevertheless, the very full sheet in the Gray Herbarium, bearing the Hitchcock & Chase revision label, looks like the other and its spikelets range from 3.2 down to 2.5 mm. in length.

Panicum agrostoides Spreng., var. **condensum** (Nash), comb nov.
P. condensum Nash in Small, Fl. Se. U. S. 93, 1327 (1903).

Panicum condensum in its most extreme development is very different from the most ideal material of *P. agrostoides;* but, unfortunately, neither of them consistently stays close to the ideal. The beautifully clear key-characters published by Hitchcock & Chase would, if they held in a larger proportion of cases, be satisfactory. As stated by them the two differ as follows:

Spikelets 1.8 to 2 mm., in occasional specimens 2.2 mm. long; panicle branches ascending or spreading.....50. *P. agrostoides.*
Spikelets about 2.5 mm. long; panicle branches erect or nearly so. 51. *P. condensum.*

Turning to their fuller accounts, contradiction is promptly discovered: the spikelets of *P. condensum* are there described, not as "about 2.5 mm. long" (the key-character), but as "2.2 to 2.5 mm. long," *i. e.* as over-lapping in measurement. Furthermore, many specimens placed under *P. agrostoides* "have rather turgid spikelets 2 to 2.2 mm. long, more or less crowded on the ascending but not appressed branches and appear to be intermediate between *P. agrostoides* and *P. condensum.* These are not cited in the distribution given below."[1] Then follows an enumeration of such transitional plants from stations from the northeastern to the southeastern and the southwestern limits of the species; while in *P. condensum* "In occasional specimens . . . . the panicle branches are ascending, the panicle not contracted, thus approaching *P. agrostoides.*"

In the representation of the species in the Gray Herbarium 63 per cent. of the specimens are characteristic *P. agrostoides*, 10 per cent. thoroughly good *P. condensum;* but 27 per cent. are admitted intermediates. That is too large a proportion of transitional specimens. The specifications, if they are desired by any student, will be gladly furnished; their detailed enumeration here would make a discussion so similar to those under *P. anceps* and *P. longifolium* as to seem unnecessary.

P. LAXIFLORUM Lam., var. **strictirameum** (Hitch. & Chase), comb. nov. *P. xalapense strictirameum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 161 (1910).

Although I am unable to find such definite trends as to keep *Panicum xalapense* HBK. (1816) apart from *P. laxiflorum* Lam. (1798), even as a variety or reasonably constant form, var. *strictirameum,* in its closer panicle of smaller and more rounded spikelets, is a striking departure from the commoner and wider-spread *P. laxiflorum.*

The characters used by Hitchcock & Chase to separate *P. xalapense* from *P. laxiflorum* are the following:

Blades ciliate and more or less pilose on the surface; spikelets 2 mm. long.....87. *P. xalapense.*
Blades glabrous or nearly so on the surface and margin; spikelets 2.2 mm. long.....86. *P. laxiflorum.*

[1] One cannot help calling to mind those trustful amateurs who, a generation ago, religiously cast into the waste-basket all specimens not conforming closely to "the books."

However, some cited specimens of the "glabrous" *P. laxiflorum* "have pilose blades like those of *P. xalapense;* the spikelets are 2.2 to 2.3 mm. long." Many of the specimens identified in the Gray Herbarium by Hitchcock & Chase and cited in their *North American Species of Panicum* as *P. xalapense* (presumably on account of a few trichomes or cilia on the foliage) have spikelets fully 2.2 mm. long and some of them actually 2.5–2.6 mm. long (larger than allowed for *P. laxiflorum*): *Biltmore Herb.*, no. 2993a; *Canby*, no. 106, "exceptional in having almost glabrous sheaths"; *Tracy*, no. 7202; *Curtiss*, no. 6602; etc. Conversely, numerous collections treated authoritatively as *P. laxiflorum* depart uncomfortably from the specifications: *Nash*, no. 239 (type-no. of *P. pyriforme* Nash), with spikelets 2.4–2.5 mm. long and some leaf-blades pilose nearly to the tip; *Churchill*, from South Jacksonville, April 11, 1897, with spikelets 2.5 mm. long but specially noted on the sheet by Mrs. Chase as "exceptionally pubescent"; *Tracy*, no. 7388, with spikelets as small as in the most theoretical *P. xalapense;* etc. The type of *P. xalapense*, with "spikelets 2 mm. long" (*H. & C.*) came from Mexico, and Hitchcock & Chase restrict *P. laxiflorum* with spikelets larger ("2.2 mm. long") to Georgia, Florida and Alabama. Nevertheless, *Pringle*, no. 13,250, from Hidalgo in Mexico, has the well developed spikelets 2.2–2.3 mm. long; and Hitchcock's collection from the type locality, Jalapa (Amer. Gr. Nat. Herb. no 84), shows some spikelets 2.2 mm. long.

Further discussion seems unnecessary.

P. MERIDIONALE Ashe, var. **albemarlense** (Ashe), comb. nov. *P. albemarlense* Ashe, Journ. Elisha Mitchell Soc. xvi. 84 (1900).

At best *P. albemarlense* seems to be only an extreme of *P. meridionale*. I have collected one or the other scores of times and am unable to find any morphological character to separate them; and it is significant that Hitchcock & Chase relied wholly on a habital tendency and on degree of pubescence:

Autumnal form widely decumbent-spreading, forming a mat; vernal culms soon geniculate-spreading; plants olivaceous. 122. *P. albemarlense.*

Autumnal form erect or leaning, never forming a mat; plants yellowish-green.....121. *P. meridionale.*

In the fuller discussion, however, they say of *P. albermarlense:* "Allied to *P. meridionale*, from which it differs mostly in the usually stouter, spreading culms, which often form large mats in the autumn, and in the softer, denser pubescence."

My own interpretation is that *P. columbianum thinium* Hitchc. & Chase, RHODORA, x. 64 (1908) is inseparable from *P. meridionale*. The habit is identical, and in all technical points they seem the same: "blades 1.5 to 4 cm. long, . . . long-pilose on the upper surface, . . . panicles 1.5 to 4 cm. long, nearly or quite as wide, ... spikelets 1.3 to 1.4 mm. long," etc. in *P. meridionale;* "blades rarely over 3 cm. long, sparsely pilose with long hairs on the upper surface . . . ; panicles 1.5 to 4 cm. long, about as wide; spikelets 1.3 to 1.4 mm. long" in *P. columbianum*, var. *thinium*. By definition there should be a difference in the length of ligules: in *P. columbianum* "ligules less than 1 mm. long," in *P. meridionale* "ligules 3 to 4 mm. long." Nevertheless, on the sheet in the Gray Herbarium specially sent out by Professor Hitchcock as typical *P. meridionale* (Amer. Gr. Nat. Herb. no. 122) it is difficult to find ligules as much as 1 mm. long.

P. LANUGINOSUM Ell., var. **fasciculatum** (Torr.), comb. nov. *P. dichotomum*, β. *fasciculatum* Torr. Fl. No. and Mid. U. S. 145 (1824). *P. nitidum*, α. *ciliatum and* δ. *pilosum* Torr. l. c. 146 (1824). *P. huachucae* Ashe, Journ. Elisha Mitchell Soc. xv. 51 (1898). *P. tennesseense* Ashe, l. c. 52 (1898). *P. unciphyllum*, forma *prostratum* Scribn. & Merr. RHODORA, iii. 124 (1901). *P. lanuginosum*, var. *huachucae* (Ashe) Hitchc. RHODORA, viii. 208 (1906). *P. huachucae*, var. *silvicola* Hitchc. & Chase, RHODORA, x. 64 (1908). *P. languidum* Hitchc. & Chase, Contrib. U. S. Nat. Herb. xv. 232 (1910). *P. huachucae*, var. *fasciculatum* (Torr.) Hubbard, RHODORA, xiv. 171 (1912). *P. Lindheimeri*, var. *fasciculatum* (Torr.) Fern. RHODORA, xxiii. 228 (Jan. 26, 1922, the number dated "October," 1921).

P. LANUGINOSUM, var. **implicatum** (Scribn.), comb. nov. *P. implicatum* (Scribn.) U. S. Dept. Agric. Div. Agrost. Bull. 11: 43, fig. 2 (1898). *P. unciphyllum implicatum* (Scribn.) Scribn. & Merr. RHODORA, iii. 123 (1901). *P. Lindheimeri*, var. *implicatum* (Scribn.) Fern. RHODORA, xxiii. 228 (Jan., 1922, misdated Oct., 1921).

P. LANUGINOSUM, var. **Lindheimeri** (Nash), comb. nov. *P. Lindheimeri* Nash, Bull. Torr. Bot. Cl. xxiv. 196 (1897). *P. Lindheimeri*, var. *typicum* Fern. RHODORA, l. c. 227 (1922).

P. LANUGINOSUM, var. **septentrionale** (Fern.), comb. nov. *P. Lindheimeri*, var. *septentrionale* Fern. RHODORA, xxiii. 227 (Jan., 1922, misdated Oct., 1921).

When I reduced[1] to *Panicum Lindheimeri* many freely intergradient plants, I failed to go far enough. In its broad panicle with freely forking branches and long pedicels, in its obovoid, pubescent spikelets with characteristic short and broad 1st glume, in the shape

[1] See RHODORA, xxiii. 141 and 223–228 (1921, 1922).

of its foliage and in its autumnal branching *P. lanuginosum* Ell. Bot. S. C. and Ga. i. 123 (1816) seems too difficult to separate *specifically* from the many plants enumerated in the preceding synonymy. The only strong tendency which separates it from them is the often denser and shorter pubescence. This, in the main, is good, but the leaf-margins often have the papillose-ciliate character of the others and the upper surfaces have a few of the long trichomes which characterize some of the other variants. Without morphological characters of the spikelets or inflorescence, but distinguished only on its usually denser pubescence, *P. lanuginosum* seems hardly separable *specifically* from the others.

Ashe, who was not averse to recognizing any variant as a "species," could not clearly distinguish *P. lanuginosum* and *P. huachucae* (see Hitchc. & Chase, p. 221). Hitchcock, in 1906, treated the two as conspecific; and Scribner & Merrill, in 1901, merging *P. implicatum* with the plants which have been separated as *P. huachucae*, but, unfortunately, under the confused name *P. unciphyllum* Trin., put *P. tennesseense* into *P. lanuginosum* and correctly said: "*Panicum lanuginosum* is extremely variable and often can only be separated arbitrarily from the related species—it is possible that it should be considered only as a variety of the preceding species." According to Hitchcock & Chase, in *P. lanuginosum* "The vernal form . . . . resembles *P. huachucae silvicola* but is larger and more velvety"; but, curiously, although *P. lanuginosum* is sharply separated in their key in *The North American Species of Panicum* by being "velvety-pubescent," while *P. tennesseense*, *implicatum*, *languidum*, *huachucae*, etc. are merely "pubescent, often villous, but not velvety," *P. ciliosum* Nash, referred definitely by them to the synonymy of the "velvety" *P. lanuginosum*, "differs in having blades glabrous on the upper surface or with a few long hairs only, but not velvety," and numerous other specimens, "because of the lack of velvety pubescence on the upper surface of the blades, may be referred to this form" (H. & C., p. 221).

The instability of the other members of this aggregate-species was sufficiently elucidated in Rhodora, xxiii. 141 and 223–228 (1921, 1922). More than a decade of later experience has strengthened the conviction that they are not specifically separable. *P. lanuginosum* Ell. (1816) is, apparently, the oldest specific name for this particularly involved group.

P. VILLOSISSIMUM Nash, var. **pseudopubescens** (Nash), comb. nov. *P. pseudopubescens* Nash, Bull. Torr. Bot. Cl. xxvi. 577 (1899).

P. VILLOSISSIMUM, var. **scoparioides** (Ashe), comb. nov. *P. scoparioides* Ashe, Journ. Elisha Mitchell Soc. xv. 53 (1898).

It is most difficult to find any constant character of the inflorescence to separate *P. pseudopubescens* and *P. scoparioides* from *P. villosissimum*. The subappressed pubescence of the former sets off a large series of specimens and these may appropriately stand as a variety. Although maintaining *P. pseudopubescens* as a species, Hitchcock & Chase do not give very emphatic distinctions:

> Vernal form similar to that of *P. villosissimum;* . . . pubescence [of spikelets] as in *P. villosissimum;* winter leaves as in *P. villosissimum.*
> This species is very closely allied to *P. villosissimum* and occasional specimens are about as close to one type as to the other.

Numerous specimens corroborate this opinion.

As to *P. scoparioides*, it seems to differ chiefly in its smoother quality, with sparser and shorter trichomes and in a tendency to have less exserted primary panicles. It is also very localized and scattered in occurrence; and it is possible that it is not a well established type, but rather a series of sporadic colonies resulting from the crossing of one of the glabrous species with small and pubescent spikelets, like *P. lanuginosum* Ell., var. *septentrionale* Fern., with the slightly coarser *P. oligosanthes* Schultes, var. *Scribnerianum* (Nash) Fern. The very few collections at hand look like the result of such a hypothetical cross.

P. COLUMBIANUM Scribn., var. **oricola** (Hitchc. & Chase), comb. nov. *P. oricola* Hitchc. & Chase, RHODORA, viii. 208 (1906).

Panicum oricola, as a coastwise variety of the wider-ranging *P. columbianum* (including *P. tsugetorum* Nash), seems to stand to that species in the same relation as *P. albemarlense* to *P. meridionale:* a more depressed and more pubescent extreme of the open sands, without significant difference in spikelet. I get no mental satisfaction from striving to keep *P. tsugetorum* apart from *P. columbianum*. In the 7th edition of Gray's Manual Hitchcock defined the almost indefinable difference: in the former "*spikelets* 1.9 *mm. long*," "*blades* 5–6 *cm. long*"; in the latter "*spikelets* 1.7 *mm. long*," "*blades* 5 *cm. long or less.*" In *The North American Species of Panicum*, however, *P. tsugetorum* is given "spikelets 1.8 to 1.9 mm. long" and "blades 4 to 7 cm. long," while these critical measurements in *P. columbianum* appear as "1.5 to 1.6 mm." and "3 to 6 cm." respectively. Further clinching

their essential identity, Mrs. Chase collects and distributes, to stand as authentic *P. columbianum* with "spikelets 1.5 to 1.6 mm. long," material (Am. Gr. Nat. Herb. no. 148) with many spikelets well over 1.6 mm. in length.

P. LANCEARIUM Trin., var. **patulum** (Scribn. & Merr.), comb. nov. *P. Nashianum patulum* Scribn. & Merr. U. S. Dept. Agric. Div. Agrost. Circ. no. 27: 9 (Dec. 4, 1900). *P. patulum* (Scribn. & Merr.) Hitchc. RHODORA, viii. 209 (1906).

Var. *patulum* was originally considered by Scribner & Merrill a variety of *P. Nashianum* Scribn. (1897), a species which Hitchcock & Chase identify with *P. lancearium* Trin. (1826). The evaluation of *P. patulum* by Scribner & Merrill seems to have been thoroughly justified: "This variety is closely related to the species, intermediate forms occurring." Hitchcock & Chase maintain *P. patulum* as a distinct species on what seem like minor ecological characters:

Blades firm, glabrous above; culms stiffly ascending. . 164. *P. lancearium.*
Blades lax, softly puberulent on both surfaces; culms decumbent. 165. *P. patulum.*

Nevertheless, they assign the culms of the "stiffly ascending" *P. lancearium* "a more or less geniculate base," while in the description the leaves become "usually glabrous on the upper surface" and the autumnal culms are "geniculate-spreading." "The following [7] specimens approach *P. patulum* in habit or in having papillose, more rounded spikelets, but the blades are not pubescent on the upper surface, or but one or two are pubescent"; while in the "readily distinguished" *P. patulum* "the blades are sometimes only obscurely pubescent above." Of the specimens of the two in the Gray Herbarium fully one-fourth are transgressors.

P. OLIGOSANTHES Schultes, var. **Scribnerianum** (Nash), comb. nov. *P. Scribnerianum* Nash, Bull. Torr. Bot. Cl. xxii. 421 (1895).

P. OLIGOSANTHES, var. **Helleri** (Nash), comb. nov. *P. Helleri* Nash, Bull. Torr. Bot. Cl. xxvi. 572 (1899).

Typical *Panicum oligosanthes* Schultes (1824), as interpreted by Hitchcock & Chase, is the plant of the southeastern Coastal Plain (but extending in the interior northward to Lake Michigan) with linear-lanceolate primary leaves mostly under 8 mm. broad and spikelets commonly 3.5–4 mm. long. Northward and westward it is represented by a plant of quite similar character (*P. Scribnerianum*) but with the primary leaves usually more lanceolate and slightly broader (up to 12 mm.) and the spikelets slightly shorter (usually under

3.5 mm. long); and southwestward the two pass by insensible transitions into *P. Helleri* which is commonly glabrous or appressed-pubescent, as in *P. oligosanthes*, thinner-leaved than in most material of the others, and with spikelets as small as in *P. Scribnerianum*.

That *P. oligosanthes*, *P. Scribnerianum* and *P. Helleri* are not truly segregated species, in the sense used by most conservative taxonomists (such indubitable species, for instance, as *P. verrucosum* Muhl., *P. depauperatum* Muhl., *P. microcarpon* Muhl., *P. dichotomum* L. (including *P. barbulatum* Michx.), *P. lucidum* Ashe, *P. xanthophysum* Gray, etc.) is made sufficiently clear by the very illuminating critical comments of Hitchcock & Chase regarding them. Their key does not sharply contrast the first with the other two, for that is separated from them and from *P. Wilcoxianum* (from which I am unable to distinguish *P. Deamii* Hitchc. & Chase in Deam, Grasses of Indiana, 283, 284, t. 75 and fig. 18) on evasive shape of spikelets, shade of green of the plants and direction of trichomes.

Spikelets narrowly obovate, subacute; plants olivaceous, appressed-pubescent.....172. *P. oligosanthes.*
Spikelets broadly obovate, turgid, blunt; plants green, pubescence, if present, not appressed.
  Blades [etc.].....168. *P. wilcoxianum.*
  Blades ascending or spreading, rarely less than 8 mm. wide, usually wider; plants not hirsute throughout.
    Spikelets 3.2 to 3.3 mm. long; blades firm; sheaths or some of them more or less hispid.....171. *P. scribnerianum.*
    Spikelets not over 3 mm. long; blades rather thin; sheaths or some of them glabrous or sparsely hispid.
170. *P. helleri.*

The key itself, when carefully checked, is sufficient indication that the quality ascribed to the blades of *P. Helleri* extends to the whole series of differential characters. Starting with the spikelets, the "narrowly obovate [*i. e.* obovoid], subacute" spikelet of the type of *P. oligosanthes* is illustrated by Hitchcock & Chase as their fig. 321; the "broadly obovate [obovoid], turgid, blunt" spikelet of the type of *P. Helleri* in their fig. 317. The very close similarity of outline of spikelets in figs. 317 and 321 is doubtless due to the facts that the autumnal state of *P. oligosanthes* has "spikelets . . . . commonly more turgid and blunt"; that some specimens of *P. oligosanthes* "appear to be intermediate between this and *P. scribnerianum*, having the narrow blades, appressed pubescence, and open, few-flowered panicles of *P. oligosanthes*, but very turgid, blunt spikelets, which, however, measure 3.5 to 3.7 mm. long"; and that in some

specimens of *P. Helleri* "The spikelets are 3 mm. long, too immature to show turgidity."

As to length of spikelets, the very definite statements in key and diagnoses need emendation. *P. oligosanthes* by the diagnosis has "spikelets 3.5 to 4 mm. long," but "In this species the spikelets vary more in size than usual in this group. The following specimens have spikelets only 3.2 to 3.3 mm. long." This is the exact size given in the key and the diagnosis for *P. Scribnerianum;* but in "A few Mississippi specimens" of the latter Hitchcock & Chase find "spikelets 3.2 to 3.6 mm. long." Spikelets 3.6 mm. long are the rule at the northeastern limit of the species, in southwestern Maine and southern New Hampshire (South Berwick, Me., *Parlin & Fernald;* York, Me., *Fernald & Long*, no. 12,547; Walpole, N. H., *Fernald*, no. 280); and upon such material from Massachusetts the range of reputedly true *P. oligosanthes* has been extended to the northeastern limit of *P. Scribnerianum* (see Hubbard, Rhodora, xv. 64). Furthermore, although *P. Helleri* has the "Spikelets not over 3 mm. long," in "a few specimens . . . . the spikelets are 3.1 to 3.2 mm. long; and *Hitchcock* 1233, with spikelets 3.3 mm. long, is referred here since the specimen shows the sprawling habit of *P. helleri.*" *P. oligosanthes*, which, as above shown, may, likewise, have the "spikelets only 3.2 to 3.3 mm. long," has the autumnal state "erect or spreading, sometimes topheavy-prostrate." The specific differentiation now seems to hang on the distinction between "sprawling" and "topheavy-prostrate." I give up!

As for the difference between "olivaceous" and "green," again I give up. The New England plant (*P. Scribnerianum*) is surely not a deep green, but rather pale. In the garden the depth of green in many plants is much altered by the increase or diminution of nitrates; *P. oligosanthes* and other species (*P. xanthophysum*, for instance) growing in open sterile sands and gravels are far less green than when they occur in richer soils. Unless supported by morphological characters, such differences in depth of green are not specific.

In the "appressed-pubescent" *P. oligosanthes* the diagnosis calls for "the papillose pubescence ascending," but in many of the specimens it diverges at an angle of 60°, while in some it is almost horizontally spreading. In *P. Helleri* with "sheaths or some of them glabrous or sparsely hispid," as opposed to *P. Scribnerianum* with "some of them more or less hispid," "little weight can be given to pubescence or lack

of it"; while *P. Scribnerianum* "is very variable in the matter of pubescence. . . . Glabrous and hispid sheaths are commonly found on the same specimen."

Ordinarily *P. oligosanthes* and *P. Scribnerianum*, growing in open sandy or rocky soil, have the firm leaves of ordinary xerophytic colonies of plants, while some of the woodland specimens of *P. Helleri* have them thinnish. Specimens of the latter species, however, such as *Bush*, no. 3893, *Hitchcock*, no. 1173, *Reverchon*, no. 2854 and *Bush*, no. 5399, growing in the open, have firm enough foliage; and in tracing *P. Scribnerianum* to its nomenclatural source (*P. scoparium* of Gray, Man. 613, not Ell.) Hitchcock & Chase designated "as the type of *P. scribnerianum*" a plant from Pennsylvania collected by John Carey in 1836. The type of *P. Scribnerianum* has leaves as thin as in the most extreme *P. Helleri*.

It is quite unnecessary to amplify by further illustrations from abundant intergradient specimens the clear demonstration supplied by the critical comments of Hitchcock & Chase, that *P. Scribnerianum* and *P. Helleri* are not specifically separable from *P. oligosanthes*. By treating them as "species" on a par with innumerable true and constant species one of the simplest and most fundamental principles of evolution and of sound taxonomy is obscured.

P. COMMUTATUM Schultes, var. **Ashei** (Pearson), comb. nov. *P. Ashei* Pearson in Ashe, Journ. Elisha Mitchell Soc. xv. 35 (1898), excluding synonym.

In their extremes *P. commutatum* and *P. Ashei* appear very different: such extremes, for instance, as the narrow-leaved stiff *P. Ashei* with wiry, slender culms grayish-puberulent, which abounds in southern New England, New York and New Jersey, appearing utterly unlike the coarser, large-leaved, glabrous plant of Florida and other southern states, true *P. commutatum*. Similarly, the firm-leaved and erect *P. commutatum* of open habitats, with comparatively pale foliage, looks, at first glance, amazingly unlike the weak and often depressed or reclining, thin- and dark-green-leaved plant of southern swamps and wet woods, which has been separated as *P. Joorii* Vasey, U. S. Dept. Agr. Div. Bot. Bull. 8: 31 (1889); but prolonged study of the plants referred by Hitchcock & Chase to these three categories and close checking of the variability of the characters emphasized by them and shown by abundant specimens fail to reveal the clear lines which we have learned, through years of experience, to look for in

true species. *P. Joorii* seems like *P. commutatum* venturing from the open sands and dry open woods into the rich southern swamps or wet woods and there displaying the simple edaphic responses which one would expect in such a habitat: deeper-green, thinner and more spreading leaves and weaker habit. I am unable to find in the material that striking asymmetry of leaf which is so emphasized by Hitchcock & Chase as to become one of their key-characters. A very slight asymmetry sometimes occurs but similar asymmetrical foliage can easily be found on sheets of *P. commutatum* from the drier open habitats and of *P. Ashei*. To me *P. Joorii* is a weak and thin-leaved state of *P. commutatum;* and *P. Ashei* is a well defined but by no means constant variety which ranges generally more to the north than does true *P. commutatum*. In the latter decision I find myself heartily in accord with the conclusion of Scribner & Merrill in their very sound and satisfying study of *The New England Species of the Genus Panicum*[1] published in 1901, though I would unhesitatingly admit *P. Ashei* as a good geographic variety. Scribner & Merrill reduced outright *P. Ashei* to *P. commutatum*, but they qualified the reduction by the note: "In the type [true *P. commutatum*] the culms are glabrous as are the nodes, but in the form which extends into New England ranging southward to Tennessee and Florida the culms, at least the lower internodes, are puberulent and the nodes often quite densely pubescent with erect, appressed hairs."[2] On characteristic New England sheets of *P. Ashei* they recorded, at that time, their conviction as follows: "*Panicum Ashei* Pearson, a form or var. of *P. commutatum* Schultes."

Turning to the extended treatment by Hitchcock & Chase we find the most significant differences, as recognized by them, in the key:

Culms crisp-puberulent; blades usually rigid, symmetrical, rarely over 10 mm. wide; spikelets about 2.5 mm. long.....183. *P. ashei.*
Culms glabrous or softly puberulent; blades firm or lax; spikelets 2.7–3.2 mm. long.
  Culms erect, or autumnal form leaning; blades symmetrical, broadly cordate.....184. *P. commutatum.*
  Culms decumbent; blades usually asymmetrical and falcate, narrowed to the scarcely cordate base.....186. *P. joorii.*

Turning to the fuller discussions by Hitchcock & Chase we find their key-characters modified. The spikelets of *P. Ashei* become "2.4–2.7 mm. long," though in "Occasional specimens . . . . only 2.1–2.3 mm. long"; and the type has the leaves "less rigid than usual."

[1] Scrib. & Merr., Rhodora, iii. 93–129 (1901).
[2] Scrib. & Merr. l. c. 116, 117 (1901).

The term *rigid* is pretty strong for a leaf which is easily bent by merely poking it against a neighboring object; and when the New England plant grows in the shade its leaves are thin and submembranaceous.

In the full description of *P. commutatum* the spikelets are defined as "2.6–2.8 mm. long," not very much larger than the "2.4–2.7" of *P. Ashei;* but "Most of the Florida specimens . . . . have . . . . spikelets 3 to 3.2 mm. long. This form can not be satisfactorily separated even as a subspecies, though extreme specimens differ sufficiently to be recognizable." In *P. Joorii* the spikelets are described as "3 to 3.1 mm. long," which should keep it apart from *P. Ashei,* but, unfortunately, there are some "doubtful" "specimens with spikelets only 2.2 to 2.5 mm. long."

As to the culms, *P. commutatum* "is typically almost glabrous, . . . but puberulence occurs rather commonly and is not found to be associated with any other character. . . . Some puberulent specimens have ordinarily wide blades and other specimens with wide blades are glabrous." Similarly with *P. Joorii:* "As a whole this species has glabrous culms, sheaths and blades, but occasional specimens more or less puberulent are found."

Although the leaf-blade of *P. commutatum* is said in the key to be symmetrical as opposed to the "usually unsymmetrical" blade of *P. Joorii,* it seems that in *P. commutatum* the "Early autumnal specimens . . . sometimes appear very different from vernal specimens, owing to the somewhat unsymmetrical broadening of the middle of the crowded upper blades."

Furthermore, "A few southwestern specimens . . . differ in appearance from *P. commutatum* . . . . and seem to approach *P. joorii,* but the spikelets are not over 2.8 mm. long." In *P. Joorii,* nevertheless, as pointed out in a preceding quotation, they may be as short as 2.2 and as long as 3.1 mm.

Although Hitchcock & Chase find *Panicum Ashei* an "unusually uniform species," it should be apparent from the contradictory statements above quoted that it belongs to that large group of so-called "species," very much favored by some of our American botanists, in which stability of characters is not required: the geographically somewhat segregated tendencies which I believe in calling geographic varieties.

On July 23, 1895, the late Thomas C. Porter collected at Chestnut

Hill, Easton, Pennsylvania, the freely branching late-summer or autumnal state of a plant which he called *P. commutatum;* the next June, on the 5th, he collected the same plant at Chestnut Hill in the vernal state, with simple culms and well developed terminal panicles. The two collections look as if they were from the identical colony; both have ashy-puberulent culms and submembranaceous leaves mostly 1–1.5 cm. wide, the larger of the primary ones 57–63-nerved. The collection of July 23 (in the Gray Herbarium) is labelled by Hitchcock & Chase as unquestioned *P. Ashei;* the material of it in the vernal stage (June 5) as *P. commutatum.* The plants, to be sure, are embarrassing, for they have the puberulence of *P. Ashei,* with the leaves overstepping the prescribed limit of 10 mm. They belong in the *intermediate* group, a status likewise shown by the number of veins in the larger leaves. I have been over the better-marked plants of *P. commutatum* of the South and the clearly defined *P. Ashei* of the North and find that in the larger leaves of the former the nerves count up to 53–99, while in *P. Ashei* they range from 31–61. The Chestnut Hill material, which is authoritatively placed in both species, shows a count of nerves too near the border-line. Another Pennsylvania sheet, *Heller,* no. 4780, collected in Lancaster County, June 5, 1901, is cited in the *North American Species of Panicum* as perfectly good *P. Ashei.* Nevertheless, the specimens of this no. in the Gray Herbarium, specially renamed by Hitchcock & Chase *P. Ashei* (probably because of puberulence on the lower internodes), show plenty of leaves 1.8–2 cm. broad.

If there is any clearly recognizable difference between the kinds of puberulence emphasized by Hitchcock & Chase ("Culms crisp-puberulent" in *P. Ashei;* "glabrous or softly puberulent" in *P. commutatum*) the soft puberulence or short pilosity is well displayed in *Bush,* no. 410, from McDonald Co., Missouri. The leaves of this no. (as represented in the Gray Herbarium) are 7–11 mm. wide; consequently it was relabelled "*P. Ashei.*" But the "softly puberulent" lower internodes and the 75 nerves of the leaves remove it technically from that "species" as defined.

It is unnecessary to multiply cases of the break-down of characters: there are before me a score or more of other examples and they include quite inseparable collections called sometimes *P. commutatum,* sometimes *P. Joorii:* for instance *Harper,* no. 1623, from Brooks Co., Georgia and *Nash,* no. 1675, from Lake Co., Florida, both cited as *P.*

commutatum; while *Hitchcock*, no. 477, from Alva, Florida and looking as if unretrievable if it became mixed with the other two, is cited as *P. Joorii.* Both identifications seem correct and they reemphasize the lack of specific differences between *P. Joorii* and *P. commutatum.*

A NEW SPECIES OF EUPHRASIA FROM NORTHWESTERN CANADA

HUGH M. RAUP

(Plate 278)

Euphrasia subarctica sp. nov. Planta 2–14 cm. alta; caulis gracilis, raro ramosus, atropurpureus, albo-pilosus, internodiis inferioribus 1–2.5 cm. longis, et ramis brevibus divergentibus. Folia et bracteae glabra, vel tenuiter scabra praecipue ad margines, 7 mm. longa plerumque breviora crasse dentata 3–4 dentibus acutis aristatis; folia inferiora apice obtusa vel rotundata. Flores in axilli plurimorum foliorum, conferti ad apicem caulis. Corolla 3–3.5 mm. longa; labium superius bilobatum, inferiore brevius; lobi laterales labii inferioris divergentes, medio angustiores; lobi emarginati vel undulati, basi flavescentes, ad apicem violacei, medio linea notati. Capsula oblongo-obovata, retuso-acuminata, calycis dentes aristatos aequans.

Plant 2–14 cm. high; stem slender, rarely branched, blackish purple, white-pilose, with the lower internodes 1–2.5 cm. long, and with branches short and spreading. Leaves and bracts glabrous or sparingly scabrous especially toward the margins, 7 mm. long, usually less, coarsely dentate with 3–4 teeth, the teeth acute and aristate-tipped, the apex of the lower leaves usually obtuse or rounded. Flowers borne in the axils of most of the leaves, gradually crowded toward the apex of the stem. Corolla 3–3.5 mm. long, upper lip bilobed, shorter than the lower, the lateral lobes of the lower lip divergent, narrower than the middle lobe; the lobes emarginate or undulate, yellowish at the base, violet toward the apex, with a greenish median line. Fruiting capsule oblong-obovate, retuse-acuminate, as long as the aristate calyx-lobes.—Damp crevices in shore rocks just east of Sand Pt., Lake Athabaska, Sept. 6, no. 4633 (TYPE). With flowers and maturing capsules. Specimens collected in "brush-land and open woods, near Fairbanks, Alaska," by *L. F. Henderson,* Aug. 2, 1932 (no. 15118) have also been studied and found to match the type material very closely.

The strongly bilobed upper lip of the corolla and the aristate toothing of the leaves place this plant clearly with *E. arctica* and *E. hudsoniana,* but its small flowers (3–3.5 mm.) immediately distinguish it from these and their relatives. Further, it differs from *E. hudsoniana*

in having the rare branches short and spreading instead of long and erect, much smaller bracts (less than 7 mm. long), corolla-lobes yellowish at the base with a median greenish line instead of "whitish with pale violet lines," and the lateral lobes of the lower lip more divergent. From *E. arctica* it differs also in having the teeth of its bracts aristate instead of merely acute. The writer is indebted to Professor M. L. Fernald for first calling his attention to the outstanding characters which set off this species.

Arnold Arboretum,
Harvard University.

Explanation of Plate 278

Fig. *1*, Euphrasia subarctica, ¾ natural size; fig. *2*, upper stem-leaves and flowers, 3 × natural size; figs. *3*, *4*, side and top views of flower, about 10 × natural size.

Apios americana Med.—Though *Apios americana* is cited correctly in Index Kewensis as published by Medikus in 1787 in Vorles. Churpf. Phys.-oekon. Gesellsch. II. 355, thus showing clearly that the name has priority over *Apios tuberosa* Moench. Meth. 165 (1794), the binomial *Apios americana* does not seem to have been adopted by any author, American or foreign. The only mention I find is by Taubert in Engler & Prantl, Nat. Pflanzenfam. III.—3, p. 365 (1894) who says under *Apios:* "5 Arten, davon *A. tuberosa* Mnch. und *A. americana* Med. in Nordamerika," apparently assuming that these names represent different species, since both appear in Index Kewensis as valid species. The reason for the neglect of this name is without doubt the great rarity of the periodical in which Medikus published *Apios americana.* It cannot be found in any American library, but there is a copy of Vorlesungen der Physikalisch-oekonomischen Gesellschaft, published in 5 volumes from 1784–1789, in the British Museum (Natural History) which I consulted last year when in London. Through the kindness of Dr. J. E. Dandy I have before me an exact copy of the description of *Apios* and *Apios americana* which is one of the 108 genera of Leguminosae treated by Medikus in a paper entitled "Versuch einer neuen Lehrart." The genus which is usually credited to Moench (1794) is well characterized by Medikus and there is also a full description of *A. americana* with the citation of *Glycine Apios* L. as a synonym. The generic name is cited by Medikus as "*Apios* Corn." and in turning to Cornut one finds in his Canaden-

EUPHRASIA SUBARCTICA: FIG. 1, × ¾; FIG. 2, × 3; FIGS. 3 and 4, flower from side and top, × 10.

sium plantarum historia (1633) on p. 200 a description and good figure of the plant under the name *Apios americana*, the very name which Medikus adopted. The synonymy of the plant now stands as follows:

Apios americana Medikus in Vorles. Churpf. Phys.-oekon. Gesellsch. II. 355 (1787).—*Glycine Apios* Linnaeus, Sp. Pl. 753 (1753).—*Apios tuberosa* Moench, Meth. 165 (1794).—*Apios Apios* Macmillan in Bull. Torr. Bot. Club XIX. 15 (1892). The generic name should be cited as *Apios* Medikus, l. c. 354 (1787).

The genus will be proposed as a nomen conservandum against *Bradlea* Adans. (1763) which includes *Apios* Med., *Wisteria* Nutt. and *Glycine* L., but which by most authors has been treated as a synonym of *Apios*.—Alfred Rehder, Arnold Arboretum.

Prunus virginiana, forma leucocarpa in New Brunswick.—On August 14, 1933, a clump of chokecherry bushes bearing light yellow fruit was observed near the Dominion Entomological Laboratory, Fredericton, New Brunswick. Gray's "Manual" records this yellow-fruited shrub as *Prunus virginiana* L. var. *leucocarpa* Wats., but Professor M. L. Fernald, to whom a specimen was sent, has kindly pointed out that the correct name is *P. virginiana*, forma *leucocarpa* (Wats.) Haynie and that it has not been recorded from Canada. Further search has brought to light the presence of several other similar clumps in the immediate vicinity. The location is on the west side of the St. John, about one-half mile from the river, on a gentle slope.

Further collecting will possibly show that the yellow-fruited form is present in other localities in the St. John Valley.—C. E. Atwood, Department of Agriculture, Fredericton, New Brunswick.

SOME CRITICAL PLANTS OF GREENLAND[1]

M. L. Fernald

(Plates 279 and 280)

The remarkable series of plants, consisting of thousands of beautifully prepared specimens collected on the Crocker Land Expedition by Dr. W. Elmer Ekblaw, was recently presented by the American Museum of Natural History to the Gray Herbarium. The detailed

[1] Published with aid to Rhodora from the National Academy of Sciences.

report upon his botanical studies in the northwestern corner of Greenland is being published elsewhere by Dr. Ekblaw, but it seems important to publish at this time a few nomenclatural and taxonomic items. These have been supplemented by notes on a recent collection received from Dr. Porsild.

Deschampsia brevifolia R. Br. Suppl. App. Parry's Voyage, 291—mispaged 191—(1824).[1] *Aira arctica* Spreng. Syst. iv.[2] (Curae Post.), 32 (1827), a renaming of *D. brevifolia* R. Br. (1824) presumably on account of the earlier and distinct *A. brevifolia* Pursh, Fl. Am. Sept. 76 (1814) and another *A. brevifolia* Bieb. Fl. Taur. Cauc. iii. 63 (1819); Trin. Mém. Acad. St. Pétersb. VI. Sci. Math. Phys. Nat. i. 56 (1831). *A. cespitosa*,[2] var. *brevifolia* (R. Br.) Trautv. Acta Hort. Petrop. i. 86 (1871), not Hartm. Scand. Fl. ed. 2: 25 (1832). *D. arctica* (Spreng.) Merr. Rhodora, iv. 143 (1902); Ostenf. Medd. Grønl. lxiv. 167 (1923). *A. cespitosa*, var. *arctica* (Spreng.) Simmons, Rep. 2nd Norweg. Arct. Exp. Fram 1898–1902. No. 2: 173, t. 9, fig. 7 (1906). *Poa evagans* Simmons, l. c. 165, t. 8, figs. 2–7 (1906), acc. to Ostenf. l. c. 168 (1923).

It will be noted that Merrill in 1902 and, later, Ostenfeld (in 1923) independently called *Deschampsia brevifolia* R. Br. (1824) *D. arctica*, based on *Aira arctica* Spreng. (1827) or Trinius (1831), because there had been species called *Aira brevifolia* prior to the publication of *Deschampsia brevifolia* by Robert Brown. Since, however, neither the *Aira brevifolia* Pursh (1814) nor the *A. brevifolia* Bieb. (1819) had been transferred to Deschampsia, *D. brevifolia* R. Br. is the correct name of the species under that generic name. If, however, the dwarf arctic species is treated as *Aira*, the situation becomes reversed, for it cannot be called *A. brevifolia* because of the earlier homonyms; it would then have to be *A. arctica* Spreng.

[1] Merrill, Rhodora, iv. 143 (1902), says p. 291 and gives the date of issue as 1821; *Index Kewensis* gives the page as 191. The account of Parry's 1st voyage was published in 1821 but the copy at the Gray Herbarium does not contain the botanical Supplement. *A Supplement to the Appendix of Captain Parry's Voyage for the Discovery of a North-West Passage, in the Years 1819–20, containing an account of the Subjects of Natural History* was published by John Murray in 1824. This supplement, containing Appendix xi. Botany or *A list of Plants, collected in Melville Island . . . with . . . Descriptions of the new Species*, by Robert Brown, F. R. S. and L. S., has an "Advertisement" signed by W. E. Parry, London, December, 1823, specially expressing his regret that it " had not yet been completed."

As to the paging, the copy before me is correctly paged from cclxii to cclxxxii; but from page cclxxxiii to ccxcviii the 1st c was omitted, after which the paging correctly continues as ccxcix, ccc, ccci, etc. The misnumbering is evident.

[2] Linnaeus clearly called his species *Aira cespitosa*. It is needless to alter his spelling to *caespitosa*, as is commonly done; the original spelling was correct and no change is justified by the International Rules. The same trivial name under other genera was repeatedly spelled by Linnaeus *cespitosa*.

Carex misandra R. Br., forma **flavida**, f. nov., a forma typica recedit squamis perigyniisque flavescentibus.—Greenland: seepage swale along small stream, Etah, lat. 78° 20′ N., long. 72° 30′ W., July 30, 1915, *W. Elmer Ekblaw* of the Crocker Land Expedition, no. 201 (type in Gray Herb.).

C. misandra, forma *flavida,* departing from the common arctic *C. misandra* (with purplish-black or castaneous spikes) in its very pale tone, is a color-form which sooner or later was likely to be found. Such extremes, with pale instead of purple-black or castaneous spikes, have already been noted in most of the related species: *C. nivalis* Boott, forma *cinnamomea* (Boott) Kükenth.; *C. atrofusca* Schkuhr, forma *flavescens* Kükenth.; *C. Banksii* Boott, forma *ochrostachya* (Phil.) Kükenth.; *C. frigida* All., forma *flavescens* Christ; and *C. fuliginosa* Schkuhr, forma *ochrostachys* Schur.

Carex anguillata Drejer, Revis. Caric. Bor. 36 (1841); Lange, Fl. Dan. xvi. fasc. xlviii. 11, t. mmdcccxlvi (1871); Pease, Rhodora, xxxii. 258 (1930).

A sheet of material sent by Dr. Morten P. Porsild, collected in southern Greenland (Amitsarssûp Qingua, Agdluitsoq-Fjord, 60° 45′ N., July 31, 1925, *A. E. & M. P. Porsild*) as a possible hybrid of *Carex Goodenowii* and *C. rigida,* is, except for its taller stature, a very satisfactory match for the Flora Danica plate of Drejer's species from Iceland. *C. anguillata,* treated by Kükenthal as a minor form of *C. rigida,* as *C. rigida,* forma *anguillata* (Drejer) Kükenthal, in Engler, Pflanzenr. iv[20]. 302 (1909), is certainly an extreme development on account of its very slender perigynia and narrow scales. It is not quite satisfactory to accept, without more study, Kükenthal's disposition of it. Incidentally, the name *C. rigida* Good. (1801) is antedated by *C. rigida* Schrank (1789); the earliest available name for the common boreal *C. rigida* Good. seems to be *C. concolor* R. Br. in Parry, Voyage, App. 283 (1824).

As indicated by Pease in the note cited, *C. anguillata* has been found outside Iceland, whence it was described, in northern Labrador, northern Ungava and on the northwest side of Hudson Bay; Pease added a station on Mt. Katahdin in Maine. It was, then, quite to be expected that the plant would be found in southern Greenland. The colony of *C. anguillata* on Mt. Katahdin could hardly have originated as a cross of *C. concolor* and *C. Goodenowii,* for in Maine the latter species is confined to the lowest altitudes and chiefly to the coast. The absence of *C. Goodenowii* from the more northern

regions of Labrador and Canada, where *C. anguillata* has been collected, also militates against the latter having had the origin suggested on Porsild's label. Further study of the plant is needed to determine whether it is a good species or a rather marked variety of *C. concolor*.

Juncus subtilis E. Meyer, Synop. Luzul. 31 (1823); Fernald, Rhodora, iii. 228 (1901); Brainerd, Rhodora, iv. 128 (1902); Buchenau in Engler, Pflanzenr. iv[36]. 168, fig. 85 (1906); Rob. & Fern. in Gray, Man. ed. 7: 275, fig. 587 (1908); Britton in Britt. & Brown, Ill. Fl. ed. 2, i. 476, fig. 1195 (1913). *J. fluitans* Michx. Fl. Bor.-Am. i. 191 (1803); Laharpe, Mon. Jonc. 135 (1827); not Lam. (1789). *J. uliginosus*, β. *subtilis* (E. Meyer) Hook. Fl. Bor.-Am. ii. 191 (1838). *J. pelocarpus*, var. *subtilis* (E. Meyer) Engelm. Trans. St. Louis Acad. ii. 456 (1866), 497 (1868). *J. pelocarpus*, var. *fluitans* (Michx.) Buchenau, Mon. Junc. 283 (1890).

For some years the Atlantic European and Atlantic American (southeastern Newfoundland; Sable Island, Nova Scotia) *Juncus bulbosus* L. (*J. supinus* Moench) has appeared in enumerations of Greenland plants. Until very recently, however, I have been unable to learn upon just what plant the Greenland records rest, a point which has been of peculiar interest to settle in view of the very characteristic Atlantic range of the species: "Europe, Algeria, Tunis, Madeira and the Azores"; also southeastern Newfoundland and Sable Island, and very doubtfully in Massachusetts.[1] This range, temperate Europe and northern Africa on the one hand, southeastern Newfoundland and Nova Scotia on the other, with or without intermediate Macronesian stations, is so typical and now so well known, that a departure from it, by an occurrence in Greenland, is, to say the least, worth investigating.

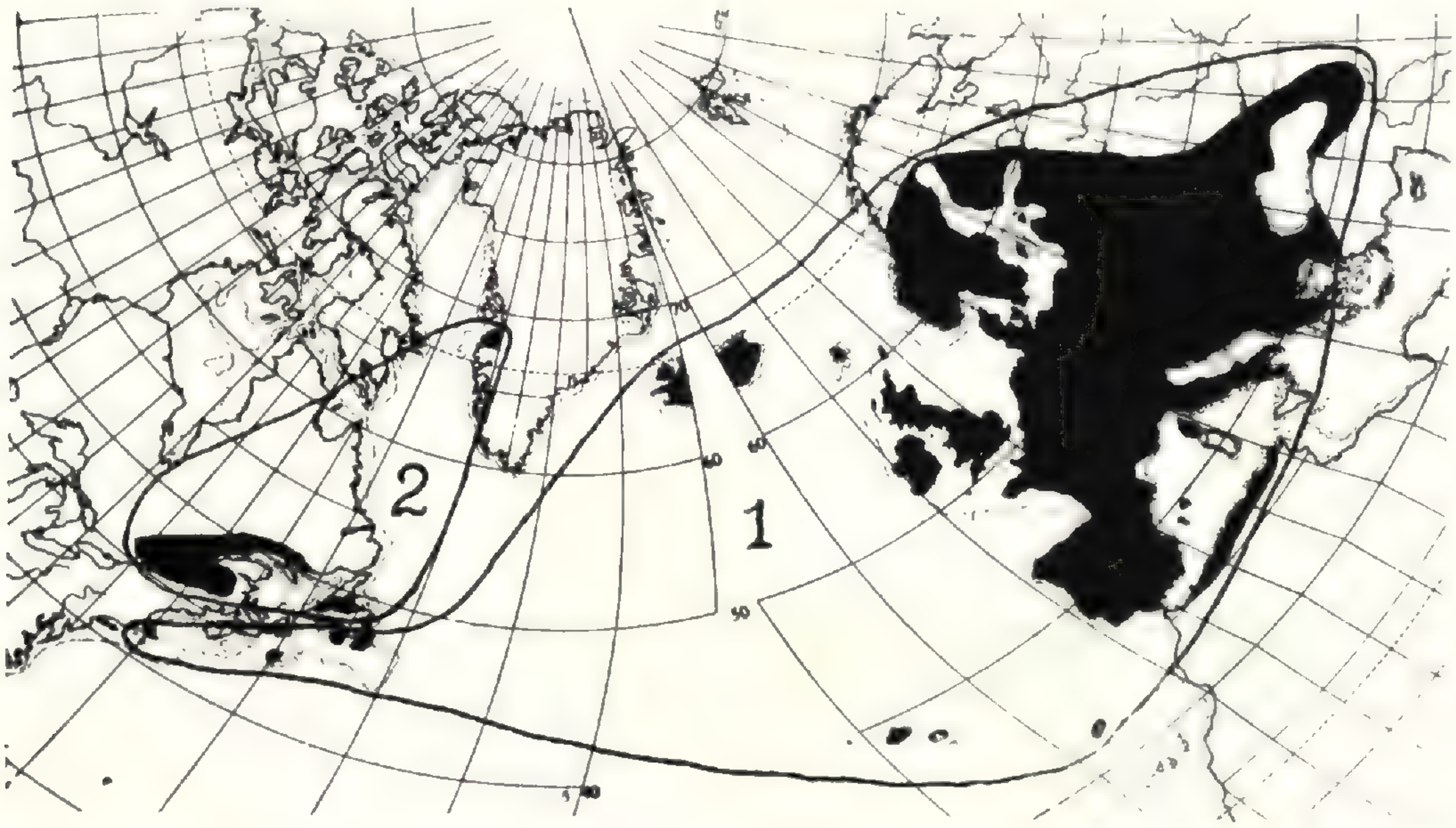
It is gratifying, therefore, to receive from Dr. Porsild very characteristic material of the Greenland plant. The nine numbers before me were all collected well up the western coast of Greenland (between 64° 30′ and 70°). They are all sterile, but some of them bear the very characteristic (in fact, thoroughly distinctive) axillary propogating buds which at once show them to be, not the European-Newfoundland *J. bulbosus*, but the strictly North American *J. subtilis* E. Meyer.

Although this is as it should be, the local plant of western Greenland American, rather than European, it is particularly noteworthy that as yet *J. subtilis* is not known in America from north of lat. 51°.

[1] Fernald, Rhodora, xxxiv. 117 (1932); see also Buchenau in Engler, Pflanzenr. iv[36]. 175. (1906).

The number of species of western Greenland which with us do not extend far north of lat. 51°–53° is very extensive. A detailed study of this relationship now progressing indicates it for a fair proportion of the Greenland flora. For the present it is sufficient to refer to a brief discussion already published, with special note of *Galium triflorum*, *G. palustre*, *Utricularia intermedia*, *Subularia aquatica* and *Callitriche hermaphroditica*.[1]

The two species of *Juncus* here discussed are so typical of considerable floras that I am appending a map of their very distinctive ranges,



Map 1. Range of Juncus bulbosus (1); of J. subtilis (2).

J. bulbosus in the larger, chiefly European area (1), *J. subtilis* in the smaller (2).[2]

Ranunculus pedatifidus J. E. Sm., var. leiocarpus (Trautv.) Fern., Rhodora, xix. 138 (1917). *R. affinis* R. Br. in Parry, 1st Voy. Suppl. App. 265 (1824). *R. affinis*, var. *leiocarpus* Trautv. in Middendorf, Reise in Sibir. i. 62 (1847).

The decisions of Dr. Britton[3] and, later, of Dr. K. C. Davis[4] and of

[1] See Fernald, *Persistence of Plants in Unglaciated Areas*, etc., Mem. Am. Acad. xv. 319–321 (1925).

[2] The map is made on Goode's Polar Equal Area Projection, no. 201 Pc. copyrighted and published by the University of Chicago Press. Supplementary specimens loaned by Dr. Porsild show the species south to lat. 64° 30′ in Greenland and north to lat. 70°.

[3] Britton, Bull Torr. Bot. Cl. xviii. 265 (1891).

[4] K. C. Davis, Minn. Bot. Stud. ii. 482 (1900).

myself that *Ranunculus affinis* is conspecific with *R. pedatifidus* is not acceptable to the Scandinavian botanists, who continue to call the circumpolar arctic-alpine species (Arctic America, Greenland, Arctic Eurasia, south along the Rocky Mts. to New Mexico, in the Hudson Bay area, in northwestern Newfoundland and on the Altai) *R. affinis*. In his Vascular Plants of Ellesmereland, Simmons gives in great detail his conclusion from studying his Ellesmereland material and the type material of *R. pedatifidus*. In his discussion of *R. affinis* he says (I can here quote only short passages from the 6-page, detailed discussion):

> It has been rather troublesome to ascertain which name the plant here in question should rightly bear. For a time I was inclined to think that it might be the *R. pedatifidus* of Smith. . . This seemed the more probable, as an american author . . . had adopted that name. But, during my stay in London, I had occasion to see the original description as well as the specimens in the Linnaean herbarium from which it was made. . . There are in the herbarium of Linnaeus, four individuals which doubtless belong to the same collection. On the paper is written in the handwriting of Smith himself: "R. pedatifidus Sm. in Rees' Cyclop. no. 72," and at one point there is a sign*,[1] which seems to be older than the label of Smith and here is added "Siberia" (in pencil by Smith).
>
> Now the original specimens, as well as the description, show that Smith has had in view, a plant very nearly allied to that which Brown soon after described from Melville Island. There are, however, some differences, that seem sufficient to separate the latter plant from that of Smith. The characters that especially separate *R. pedatifidus* from *R. affinis* are: the almost circular circumference of its basal leaves, that are very deeply cut in a great number of very narrow, or almost entirely linear, segments, with obtuse points, evidently grouped after a pedate design, with a smaller middle, and two larger lateral, main lobes. The middle lobe is only equipped with two lateral secondary lobes halfway from the base, and these show a tendency to be again cleft. The lateral lobes are deeply cut into at least three or four secondary lobes, that only cohere a little above the basis, and are again deeply cleft. The leaf is thus formed of a great number of narrow, or almost filiform, segments. The basal leaves are more or less equipped with sparse white hairs. The stem leaves are sessile or have a very short peduncle. The lower ones resemble the basal leaves, but their segments are longer, do not stand so close together, and become fewer in the upper leaves, finally being only three. The sheath of the stem leaves half-embracing, not so white-membraneous as in *R. affinis*. The plant is smaller and more slender in all parts, the flowers are not inconsiderably smaller. The white hair-covering of the stem is more prominent, and not reduced only to the parts immediately below the insertions of the leaves. Especially the part of

[1] Simmons here mistook for an asterisk the symbol between the two specimens which, Mr. Pugsley informs me, "indicates that it came from Siberia and was communicated by Gmelin." This and the other signs used by Linnaeus were explained by the late Dr. B. Daydon Jackson in his Index to the Linnean Herbarium, 19 (1912).

the stem below the lowest leaf is hairy. The flower-stalk is, in the dried specimens at least, prominently canaliculate.

The true *R. pedatifidus*, Sm. is, as far as I know, only found in Asia, especially in Eastern Siberia and also in the islands of the Bering Sea.

I think, however, that a new description, formed after my Ellesmereland specimens, may not be out of place.

R. affinis: perennis, plus minusve caespitosus, caule 15–25 cm. alto, glabro vel pilis parcis, subadpressis, brevisque, inferne longioribus, obsito; folia basalia longe petiolata, vaginis latis, membranaceis, albis, instructa, semper profunde pedatifida, petiolis parce pilosis; folia caulina brevissime petiolata vel sessilia, late membranaceo-vaginata, marginis vaginae pilis longis albis instructis, pedato-multifida, lobis 5–9 angustis, acutiusculis; flos 2–3 cm. latus; sepala purpurascentia, parce pilosa, petalis dimidio breviora; petala flava, violaceo-nervata, obovata; torus cum carpellis per anthesin ovatus, postea cylindraceus; achenia parce pilosa, rostro brevi recurvo.

. . . . . .

The only time I found this species, August 8, 1900, it bore flowers as well as fruit in all stages abundantly.[1]

The series to which *R. pedatifidus* and *R. affinis* belong is most difficult and the intricate relationships and interrelationships can not satisfactorily be resolved in a single limited herbarium nor on the basis of knowledge of variation gained from a single field-experience. One of the type sheets of *R. pedatifidus* has been photographed through the great kindness of Dr. H. K. Svenson, who, while in London arranged with Mr. R. G. Pugsley at the Linnean Society for the photographing of it. This photograph (PLATE 279) shows the basal leaves more uniformly, deeply and numerously divided than in most of the Arctic plant. The original specimens, collected in Siberia by Gmelin, are very closely matched by the equally beautiful material (PLATE 280, FIG. 1) collected on Mt. Sinjucka in the Altai by Krylov on May 22, 1901, and originally called *R. affinis* R. Br., but later changed to *R. amoenus* Ledeb.

Although this Siberian (Altai) plant, true *R. pedatifidus*, is not absolutely matched by American material, its only sharp difference, so far as I can make out from the photograph of the Gmelin material (the type) and from the Krylov sheet, is the more uniformly dissected foliage. Many North American and Greenland specimens are as pubescent; the sepals and their minute pilosity are closely matched by those of several Arctic American specimens and the carpels (in the Krylov material) are not, to me, different. In North America

[1] Simmons, Vasc. Pl. Ellesmereland. Rep. Second Norg. Arctic Exped. "Fram" 1898–1902. No. 2: 101–107 (1906).

the plant varies excessively in foliage, just as do many other species of the group. In the Rocky Mountain area the basal leaves may be very similar (PLATE 280, FIG. 2) to those of Smith's type or they may be uncleft, *R. pedatifidus*, var. *cardiophyllus* (Gray) Britton. Eastward and in the Arctic the uncleft leaves are rare, but most of the basal leaves are less cleft than in the Asiatic type. So complete a series (PLATE 280, FIGS. 2–4), however, can be built up from specimens of North America (including Greenland) that I am at a loss to find anything more than geographic varieties, certainly not distinct species, among these plants. The Ellesmereland plant was beautifully illustrated by Simmons (his plate 4, figs. 2–5) and, although he states that *R. pedatifidus* "is smaller and more slender in all parts, the flowers not inconsiderably smaller," his plate (× ½) does not well sustain this differentiation. In unfavorable situations such as those of the type-collection (PLATE 280, FIG. 4) of *R. affinis*, it may mature with a total height of a few centimeters; in more favorable environment, it may be 4 dm. high, but without change of the morphological characters. Until it is more convincingly demonstrated than has yet been done that *R. affinis* and *R. pedatifidus* are specifically distinct, I am compelled to consider them two geographic varieties of a very polymorphus circumpolar species.

ARNICA ALPINA (L.) Olin, var. **angustifolia** (Vahl), comb. nov. *A. angustifolia* Vahl, Fl. Dan. ix. fasc. xxvi. 3, t. mdxxiv (1816). *A. montana*, β. *angustifolia* (Vahl) Hook. Fl. Bor.-Am. i. 330 (1834), at least as to name-bringing synonym.

Although very close to the Lapland *A. alpina*, the plant of Greenland and adjacent regions differs almost consistently in the shorter teeth of the ligules. In the Scandinavian plant (true *A. alpina*), as shown especially by the beautiful modern specimens collected by Alm, but also by older and more fragmentary specimens of *N. J. Anderson, Wickström, Åhrling & Brandelius*, and others, the sharp teeth or lobes of the ligules are 2–6 mm. long. In the large series of Greenland specimens (*A. angustifolia*) the teeth or lobes are much shorter, 0.5–1.5, rarely –2, mm. long. The difference is well brought out in the photograph, showing tips of ligules, × 2, Lapland specimens, both from Torne Lappmark, of true *A. alpina* at the left (FIG. 1, July 9, 1926, *Alm;* FIG. 2, August 14, 1923, *Alm*); a Greenland specimens at right (FIG. 3).

Ligules, × 2, of ARNICA ALPINA (FIGS. 1 and 2); of var. ANGUSTIFOLIA (FIG. 3).

EXPLANATION OF PLATES 279 AND 280

PLATE 279. TYPE of RANUNCULUS PEDATIFIDUS J. E. Sm., from Siberia, coll. *Gmelin*, in Linnean Herb. (Photograph, × 1, presented by Dr. *H. K. Svenson*, through Mr. *R. G. Pugsley* of the Linnean Society of London).

PLATE 280. FIG. 1, RANUNCULUS PEDATIFIDUS from Mt. Sinjuck in the Altai, Siberia, May 22, 1901, *Krylov;* FIG. 2, from Elbow River, Alberta, *J. Macoun*, no. 18,035; FIG. 3, R. PEDATIFIDUS, var. LEIOCARPUS (Trautv.) Fern., from Disko, Greenland, July 1, 1929, *R. T. Porsild;* FIG. 4, from Melville Island, 1820, *John Edwards*, ISOTYPE of *R. affinis* R. Br. Photograph by Dr. *L. B. Smith*, all specimens × 1.

HAMAMELIS VIRGINIANA IN MISSOURI

JULIAN A. STEYERMARK

IN 1911 Sargent described[1] under the name *Hamamelis vernalis* a new species based upon material from Missouri, northern Arkansas, and eastern Oklahoma. This new species was distinguished from the eastern *H. virginiana* with which it had been confused by the following characteristics, namely, (1) the period of anthesis occurred be-

[1] Sargent, C. S. Trees and Shrubs. **2**: 137. 1911.

tween the last of January and the first of April instead of late autumn and early winter, (2) the inner surface of the calyx-lobes was suffused with reddish, whereas in *H. virginiana* it was entirely greenish or yellowish-green, (3) the youngest branchlets were densely stellate-tomentose, whereas they were less pubescent to finally glabrate or nearly so in *H. virginiana*, (4) the plants spread vegetatively by an extensive underground shoot system which resulted in thickets, and (5) the habitat was gravelly beds of streams or rocky bars along creeks instead of upland areas and wooded slopes. Moreover, in *H. vernalis* the bases of the leaf-blades tended towards subcuneate.

In Missouri *H. vernalis* has hitherto been the only species known to the state, and is found only in the Ozark Region in the southern portion of the state, chiefly in the Iron Mountain and St. Francois Hills section of southeastern Missouri, and along the White River and tributaries in the southwestern part of the state. Its range extends north in the Ozark region to Pulaski and Jefferson counties.

In the early part of November, 1930, the writer visited the so-called "Royal Gorge" in Iron Co., in the southeastern Ozark region of Missouri. This "gorge" is one of many similar canyons in the granitic and porphyritic trachyte region which has been chiselled by stream erosion. In the narrow bouldery stream-bed grew thickets of fruiting *Hamamelis vernalis* with its characteristic bushy habit of growth; but on the lower rocky wooded slopes of the canyon above the stream-bed occurred numerous plants of another *Hamamelis* in full bloom! This was quite unusual, since the Ozark Witch Hazel, *H. vernalis*, blooms from January to April and grows in rocky stream-beds and along gravel bars; but none of the plants of *H. vernalis* in the stream-bed were in bloom, nor showed any signs of coming into bloom for a long time. An examination of the young branchlets of the season of the flowering plants growing on the wooded slopes revealed that their twigs were slightly pubescent to glabrate; also there was no reddish coloring on the inner surface of the calyx-lobes. Such evidence seemed to point to the fact that these late-flowering plants were *H. virginiana* rather than *H. vernalis*.

Not until the latter part of February, 1933, did the writer have an opportunity to re-visit this interesting locality. Then the situation was exactly the reverse to that of the previous visit. All the plants occurring in the rocky stream-bed were in full flower, and showed all the distinguishing traits of *H. vernalis*. On the other hand, none of

the plants growing on the wooded slopes above the stream-bed were in flower. That they had already blossomed two or more months previously was shown by the fact that the petals had mostly fallen from the calyx, and in a few cases in which they were still attached they were mainly dried and brown. Moreover, the *Hamamelis* of the wooded slopes all showed the youngest branchlets to be slightly pubescent or glabrate, whereas those of the plants in the rocky stream-bed were densely tomentose.

A comparison of material of the autumn-flowering *Hamamelis* from "Royal Gorge" with herbarium specimens of the eastern *H. virginiana* in the Missouri Botanical Garden Herbarium as well as with living plants of this species growing in the Missouri Botanical Garden likewise served to identify these plants with *H. virginiana*. At this season of the year, i. e., late February, the ovary of the autumn-flowering plants at "Royal Gorge" was very small, and was practically no more developed than in anthesis. This fact was also borne out upon comparison of the ovaries with the living plants of *H. virginiana* in the Missouri Botanical Garden. The appearance of the inner surface of the calyx was likewise similar in both.

The same locality was studied during the first week in November, 1933, and the situation was exactly as expected, that is, the *Hamamelis vernalis* of the rocky stream-bed was in the dormant winter-bud stage, and showed no signs of blooming for some months, whereas the *H. virginiana* of the rocky slopes and ground above and along the stream course was in full bloom with lemon-yellow petals and the inner surface of the calyx-lobes greenish or yellowish-green.

With this evidence at hand it was expected that with careful search *Hamamelis virginiana* might be found in some of the surrounding counties of the state where granitic or porphyritic trachyte canyons abound. Accordingly, a trip was made the following week in November to adjacent Reynolds county. Along the East Fork of the Black River in southern Iron Co. and again in Reynolds Co. were many plants of *H. virginiana* in full bloom on the lower slopes of the hills and in the wooded valleys. It was interesting to note that where both *H. vernalis* and *H. virginiana* occurred in the same region there was a slight overlap in habitat, the former extending to the outer margin of the gravel bars and rocky stream-beds and the latter close to the rocky portion of the stream bar. However, the former kept to the rockiest portions of the stream bar and never occurred on the adjacent

wooded slopes, whereas the latter was common on the rocky wooded slopes, and while descending to the wooded valley to the edges of the rocky stream-bed did not take to the rockiest portion of the bar as did *H. vernalis*. Although these two species may occur side by side in Missouri, there is no opportunity for natural crossing to occur, since the time of anthesis is quite different. Also the distinctive morphological characters for each species have been maintained throughout.

There can be no doubt, then, that both species of *Hamamelis*, i. e., *H. vernalis* and *H. virginiana*, occur in Missouri. It is not surprising to find *H. virginiana* in eastern Missouri, and especially in the southeastern Ozark region, inasmuch as quite a number of eastern species are known in Missouri only from this southeastern area, such as *Pedicularis lanceolata*, *Goodyera pubescens*, *Lycopodium complanatum* var. *flabelliforme*, *Dennstaedtia punctilobula*, *Thelypteris spinulosa* var. *intermedia*, *Asplenium pinnatifidum*, *Ilex verticillata* var. *padifolia*, *Rhododendron roseum*, *Viola pallens*, *Frasera caroliniensis*, *Phlox maculata*, and many others. Moreover, quite a few of these eastern species in the southeastern Ozark region are known only from the Iron Mountain section, such as *Ilex verticillata* var. *padifolia*, *Pedicularis lanceolata*, and *Phlox maculata*. Associated with the *Hamamelis virginiana* on the wooded slopes at "Royal Gorge" were such eastern species as *Quercus coccinea*, *Acer saccharum* var. *glaucum*, *Acer rubrum*, *Ostrya virginica*, *Vaccinium arboreum* var. *glaucescens* and along the stream-bed *Ilex verticillata* var. *padifolia*, *Alnus rugosa*, and *Gentiana quinquefolia*. At the time of the influx or migration of many of these eastern species into the southeastern Ozark region *Hamamelis virginiana* probably appeared along with its associates, *Quercus coccinea*, *Acer rubrum*, *Acer saccharum* var. *glaucum*, *Ostrya virginica*, *Ilex verticillata* var. *padifolia*, and a number of others. This eastern invasion into southeastern Missouri may have occurred near the close of the Tertiary following the last uplift of the Ozark region, or it may have taken place following one of the retreats or advances of one of the Pleistocene ice-movements. The appearance of *Hamamelis virginiana* in this section of southeastern Missouri is therefore in accordance with the occurrence of a number of other eastern species which reach the Ozark region in limited distribution.

Missouri Botanical Garden, St. Louis.

Volume 36, no. 422, including pages 25 to 60, was issued 1 February, 1934.

TYPE of RANUNCULUS PEDATIFIDUS, × 1.

RANUNCULUS PEDATIFIDUS, × 1; FIG. 1, from the Altai; FIG. 2, from Alberta; FIG. 3, from Greenland; FIG. 4, from Melville Island (ISOTYPE of *R. affinis*).

1 0 1934

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Type of Antennaria alpina, × 1.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. April, 1934. No. 424.

ANTENNARIA OF ARCTIC AMERICA[1]

M. O. Malte

(Plate 281)

While the *Antennariae* of Southern Canada, Newfoundland and the United States have been studied intensively and critically, particularly by Greene and Fernald, the forms of the arctic parts of the continent have so far attracted little attention. This is not surprising when it is taken into consideration that collections in the past have been largely made by casual visitors, often without any botanical training whatever. As a result, the earlier collections of arctic *Antennariae* are often very scanty, often badly collected, and frequently mixed, thus offering little attraction and generally great difficulties to the investigator studying them in herbaria. To base conclusions and new species on scanty and otherwise imperfect specimens serves really no good purpose, and the writer has therefore refrained from bothering with such material. The arctic American material investigated is that of the Gray Herbarium, Cambridge, Mass., the United States National Herbarium, Washington, D. C., the Herbarium of the New York Botanical Garden, New York, the Herbarium of the Academy of Natural Sciences, Philadelphia, Pa., as well as that of the National Herbarium of Canada, Ottawa.

[1] Published with the permission of the Director, National Museum of Canada, Department of Mines, Ottawa.

This monograph formed part of the Flora of Arctic Canada in course of preparation by Drs. M. O. Malte and C. H. Ostenfeld, an important work left unfinished by the lamentable and untimely death of Ostenfeld in 1931 and of Malte in 1933. The labels of specimens and other internal evidence indicate that the manuscript on *Antennaria* was prepared by Malte, after the death of Ostenfeld.—Eds.

DOES A. ALPINA (L.) GAERTN. OCCUR IN NORTH AMERICA?

In order to ascertain if true *A. alpina* (L.) Gaertn., as some authors maintain, really occurs in North America, and particularly in the arctic parts, where of course it is more likely to be found than in any other section of the continent, the writer has examined the Linnean specimens, lying under the name of *Gnaphalium alpinum*, in the Herbarium of the Linnean Society, London. There are two sheets, both marked in the handwriting of Linnaeus. One of the sheets, No. 70, has only the name *alpinum* inscribed on it. The other, No. 71, has in addition H. U. (Hortus Upsaliensis) and Lapp. (Lapponia). The specimens on both sheets are identical but, as No. 71 has the fullest information, it should be considered the type.

The type (PLATE 281) is a pleicephalous plant with basal rosettes borne on well developed stolons; their leaves are narrowly spathulate, mucronate, green and glabrous above, silky flocculose-tomentose and silvery-lustrous underneath. The inner bracts of the involucre are about 7 mm. long, linear-lanceolate, long-attenuate, light brown.

With the type thus precisionized it has been easy to ascertain that true *A. alpina* does not occur in North America. At least, the writer has seen no specimens matching the type.

The description of *A. alpina* given by Britton & Brown (Ill. Fl. **3.** 449) clearly indicates that their *A. alpina* embraces more than one element. What Rydberg's (Fl. Rky. Mts. ed. 2: 916) *A. alpina* is, can only be determined after an examination of the specimens so labelled by him. Similarly, to speculate over what Simmons' (Phytogeography, 127) *A. alpina* is, is futile. Only an examination of the specimens cited by him, can settle the question.

Fernald asserts that typical *A. alpina* occurs in arctic America, south to Kangalaksiorvik Bay, Labrador (*Owen Bryant*), etc. The Bryant plant is *A. angustata* Greene.

A note by Greene concerning the occurrence of *A. alpina* in North America has apparently been overlooked, or else no attention has been paid to it. Greene writes (Pittonia, **3,** 1898, 284) that *A. alpina* "is not known to occur on the North American continent, unless perhaps a sheet of specimens (n. 11239) in Canadian Survey collection, said to have been obtained on the Arctic sea coast by Dr. Richardson, may represent it." The specimens referred to do not belong to *A. alpina*. They belong to *A. angustata* Greene or a species closely related to it.

Key Characters

When Greene wrote his paper, entitled "Some northern species of *Antennaria*" (Pittonia, **3,** 1898, 273–289), he had at his disposal the entire collection of *Antennaria* belonging to the National Museum of Canada—then called the Museum of the Geological Survey of Canada. In this paper he divides the genus into two groups, as follows:

1. Tips of involucral bracts white or pink.
2. Tips of involucral bracts brownish or dark brown.

Fernald (Rhodora, **26,** 1924, 96–97) also lays particular stress on the colour of the bracts and uses this character as one of the leading ones in his key.

When working up the Canadian arctic material, the writer found the colour character somewhat unsatisfactory. This is particularly the case in *A. pygmaea.* In this species the tips of the inner bracts vary from white to stramineous and, if the species is arranged in the key according to colour of the bracts, it may sometimes be placed in one group and sometimes in another. The writer has therefore substituted the shape of the inner bracts for the colour, and has found this arrangement working smoothly. *A. isolepis* and *A. pygmaea* then fall into one group and *A. canescens* down to and including *A. hudsonica* into another.

An important character is the presence or absence of procumbent stolons. When such are present, more or less extended mats are formed; when they are absent, the individual plants grow separately. This is an excellent character in the field. When one has to deal with scrappy and haphazardly collected specimens, such as are often found in herbaria, the character is, of course, not so good, but that in no way detracts from its inherent value. It only emphasizes the fact that Antennarias, to be of real value as herbarium specimens, should be collected with extreme care and that, when the collections are made, field notes indicating the mode of growth should, whenever possible, be taken.

A third set of characters, which at first did not seem very promising, has turned out to be of considerable value. These characters are monocephalism and pleiocephalism. In normally monocephalous species, such as *A. pygmaea, A. burwellensis, A. angustata,* and *A. hudsonica,* specimens are found in which more than one head occur. At first glance this fact appears to diminish the value of monocepha-

lism and pleiocephalism as key characters considerably or even nullify it altogether. But this is really not the case. The apparent pleiocephalism is in reality only pseudo-pleiocephalism. In real pleiocephalism the several heads are arranged in a corymb without any bracts subtending the branches. In the case of pseudo-pleiocephalism the supernumerary heads emerge from the axis of the uppermost stem-leaves. Their pedicels are often much more slender than the top of the stem bearing the normal head, and their heads are very often overtopping the normal one. A beautiful example of such pseudo-pleiocephalism is furnished by *A. ungavensis* (page 110) which normally is monocephalous but frequently develops an extra head from the axis of the uppermost stem-leaf. This supernumerary head is borne on a very slender, almost filiform, pedicel up to 2.5 cm. long, and is much over-topping the normal head.

Synopsis of Antennaria in Arctic America

a. Basal leaves 4 cm. long or more, generally 3-nerved....1. *A. pulcherrima.*
a. Basal leaves at most 2 cm. long, always 1-nerved....*b.*
b. Rosette-leaves very sparsely pubescent underneath; stem glabrous.....2. *A. nitens.*
b. Rosette-leaves densely pubescent underneath; stem pubescent; pappus-bristles of male flowers clavellate-dilated....*c.*
c. Involucre 4–5 mm. high; Bering Sea species....*d.*
d. Monocephalous; rosette-leaves glabrous above.3. *A. monocephala.*
d. Pleiocephalous; rosette-leaves tomentose on both sides.....4. *A. alaskana.*
c. Involucre about 6 mm. high or more, only female plant known....*e.*
e. Inner bracts of involucre obtuse or only slightly acutish....*f.*
f. Mature rosette-leaves densely white-tomentose on both sides; heads several, generally in an open corymbiform inflorescence.....5. *A. isolepis.*
f. Mature rosette-leaves green, glabrous or glabrate above; heads normally solitary.....6. *A. pygmaea.*
e. Inner bracts of involucre sharply acute to long-attenuate....*g.*
g. Basal rosettes borne on normally well developed, prostrate or ascending stolons....*h.*
h. Normally pleiocephalous....*i.*
i. Involucre bright green below, dark brown above. 7. *A. canescens.*
i. Involucre inconspicuously green below, light brown above.....8. *A. arenicola.*
h. Normally monocephalous....*j.*
j. Middle bracts of the involucre linear-lanceolate 9. *A. Sornborgeri.*
j. Middle bracts of the involucre broadly lanceolate to ovate-lanceolate.....10. *A. burwellensis.*
g. Basal rosettes sessile or subsessile, erect or suberect....*k.*
k. Tomentum of the mature rosette-leaves equally dense on both surfaces; pleiocephalous....*l.*

l. Rosette-leaves spathulate, rounded at apex; pappus white....*m.*
m. Tomentum white; inner bracts broadly lanceolate, generally abruptly contracted toward the acute apex.....11. *A. compacta.*
m. Tomentum greyish; inner bracts linear-lanceolate, acuminate to attenuate.....12. *A. subcanescens.*
l. Rosette-leaves narrowly oblanceolate, gradually contracted toward the acute apex; pappus subrufescent.....13. *A. labradorica.*
k. Tomentum of the mature rosette-leaves in age becoming much sparser on the upper surface than on the lower, or wanting....*n.*
n. Normally pleiocephalous.....14. *A. congesta.*
n. Normally monocephalous....*o.*
o. Involucral bracts generally olivaceous, the middle ones lanceolate to ovate-lanceolate, acute.....15. *A. angustata.*
o. Involucral bracts generally light brown, the middle ones, like the innermost ones, linear to linear-lanceolate, long-attenuate....16. *A. hudsonica.*

1. A. PULCHERRIMA (Hook.) Greene, Pittonia, **3**, 1897, 176. *A. carpathica* var. *pulcherrima* Hook., Fl. Bor.-Am. **1**, 1834, 329, Macoun, Cat. Can. Pl., pt. 2, 1884, 237. *A. carpathica,* Macoun, l. c., 236, non Bluff & Fing. *A. lanata* (Hook.) Greene, Pittonia, **3**, 1897, 288. *A. sp.*, Ostenfeld, Gjoa Exp. Kristiania Vid. Selsk. Skr., 1910, 67.—The whole plant white-tomentose; stem 1–5 dm. high, from a subterranean, branching caudex; radical leaves oblanceolate, acute, 4–12 cm. long, 3-nerved or, in dwarfed specimens, 1- or 2-nerved; cauline-leaves linear; heads several, in a corymb; involucre 5–7 mm. high; the outer bracts more or less dark coloured below, the inner white to umber at tip; those of the pistillate heads lanceolate to linear-lanceolate, acute to long-attenuate; those of the staminate heads elliptic, obtuse; pappus bristles of the male flowers clavate; style long-exserted, 2-cleft.—QUEBEC: No. 116,979, Richmond Gulf, east coast of Hudson Bay, *W. Spreadborough,* July 1, 1896. YUKON TERRITORY: King Point, *A. Lindström,* 1906 (Oslo).

When Greene raised Hooker's *A. carpathica* var. *lanata* to specific rank, his main reasons for doing so were that "the radical leaves in *A. lanata,* as compared with those of *A. pulcherrima* are small and *nerveless* (the italics are mine); the tips of its involucral bracts in the male are broad, obovate, and very obtuse, while in the female the herbaceous body of the bract is greatly narrowed and elongated, and with a narrow white tip."

All the four specimens cited by Greene are in the National Herbarium of Canada. A close examination of the largest radical leaves reveals that in one of the specimens they are 1-nerved, in another 1–3-nerved, and in the two others 3-nerved, as in *A. pulcherrima.* The only difference is that in *A. lanata* they are hidden by the tomentum but, when the latter is removed, the nerves become quite plain.

As far as the shape and colour of the involucral bracts are concerned,

the writer is unable to detect any essential difference between *A. pulcherrima* and *A. lanata*. The latter, in the writer's opinion, is merely an ecological form or at most a variety of the former.

2. A. NITENS Greene, Ottawa Nat. **25**, 1912, 42.—About 1 dm. high; basal rosettes erect, sessile or subsessile; their leaves about 1 cm. long, spathulately oblanceolate, mucronate, vividly green and glabrous above, minutely and sparsely silky underneath; cauline leaves linear, glabrous, all tipped with a flat, glabrous, scarious, elliptic appendage about 2 mm. long; stem glabrous; heads solitary; involucre 6–7 mm. high, the bracts glabrous or nearly so, oblanceolate, with a dull brown, acute or acuminate, and serrulate tip. Pappus bristles strongly barbellate from below the middle to near the summit. Only the female plant known.—NORTHWEST TERRITORIES, KEEWATIN: No. 79,269. Wager Inlet, northwest coast of Hudson Bay, Lat. 65° 15′ N., *J. M. Macoun.*

3. A. MONOCEPHALA DC., Prodr. **6**, 1837, 269.—Dwarf, about 10 cm. high or less, often forming large mats, basal rosettes short, erect or suberect, their leaves spathulate, on the average about 10 mm. long and 3 mm. wide, mucronate, floccose-tomentose below, green and glabrous above; cauline leaves 5–6, linear, loosely lanate, their tips with a flat, scarious, glabrous, brown appendage about 2 mm. long; stem loosely lanate; heads solitary; involucre 4 mm. high, the bracts dark brown to almost black in the middle, olivaceous to golden buff at tip, inner bracts of the pistillate heads linear-lanceolate, acuminate; those of the staminate heads elliptic, obtuse or acutish; corolla of the pistillate flowers about 0.2 mm. wide, that of the staminate flowers 0.6–1 mm. wide; pappus-bristles of the male flowers clavate; style long-exserted, 2-cleft.[1]—ALASKA: Cape Nome, summer, 1910, *H. E. Blaisdell* (Gray); No. 1896, Vicinity of Port Clarence, Aug. 22, 1901, *F. A. Walpole;* vicinity of Port Clarence, Aug. 12, 1901, *F. A. Walpole.*

It has been maintained by some authors that *A. monocephala* DC. occurs in Arctic Canada, Labrador, and Greenland. To settle if that really is so, the writer has endeavoured to ascertain what the true *A. monocephala* of DeCandolle is. Through the good offices of Dr. F. T. Wahlen and Dr. W. Koch, Zurich, Switzerland, the information has been secured from Dr. A. Becherer, Assistant, Conservatoire Botanique de la Ville de Genève, that in DeCandolle's herbarium there are four collections of *A. monocephala* DC. made prior to 1837, the year the species was described. Three of these are by DeChamisso, one collected in 1825 and two in 1831, and one by Fischer, collected in

[1] Description drawn from field No. 154, Glacier River, Unalaska, *Edwin C. Van Dyke*, July 21, 1907 (two male individuals), and specimens from Cape Nome, Alaska, *H. E. Blaisdell*, Summer 1900 (five female individuals). Both collections are in the Gray Herbarium.

1828, both cited as collectors of the original *A. monocephala* (DeCandolle, Prodr. **6,** 1837, 269).

When seeking information about *A. monocephala* in DeCandolle's herbarium, the writer inquired if there was a specimen there which should be considered the type of the species and asked, if there was, to be supplied with a photograph of it. For reply, Dr. Becherer has kindly furnished an excellent and much appreciated photograph of the sheet holding de Chamisso's 1825 collection, made in Unalaschka. This, being the first collection of *A. monocephala* DC., should therefore be considered the type.

A. monocephala DC. is entirely different from any of the *Antennariae* so far known from arctic Canada and adjacent parts of Labrador, and references to its occurrence there are due to misinterpretation of the species. A collection in the Gray Herbarium from Labrador, near Hebron, Lat. 58° 17′, no date, collector Mentzel (ex herb. J. Steetz), consisting of three specimens, has a label marked "Syn. Fl. N. Amer." One of the three individuals is called *A. alpina* de Cand. var. *monocephala.* It is a monocephalous form of *A. canescens* (Lge.) Malte.

Porsild maintains (Medd. Groenl., **51,** 1915, 271) that *A. monocephala* DC., considered as a synonym of *A. alpina* var. *Friesiana* Trautv., occurs in Greenland. This is exceedingly improbable. A collection from the southern district of Egedesminde, at Giesecke's Lake, Lat. 67° 44′, July 31, 1924, by *A. E. Porsild,* labelled *A. alpina* var. *monocephala,* is *A. angustata* Greene.

A. monocephala DC. is a Siberian and northwest North American plant, apparently common in the Aleutian Islands and extending as far north as Port Clarence, Alaska, and perhaps still farther. Forms, either identical with it or closely related, have also been collected in northern British Columbia, e. g. by Mrs. Norman Henry, 1932 (Herb. Acad. Nat. Sci., Philadelphia).

4. A. **alaskana,** n. sp. Planta nana, 3–6 cm. alta; sarmentis brevibus, erectis vel suberectis; foliis radicalibus anguste spathulatis, ad 1.6 cm. longis, ca. 3 mm. latis mucronatis, utrinque dense tomentosis; foliis caulinis paucis, ca. 3–4, linearibus, laxe lanatis, apice plano scarioso glabro 1.5–2.5 mm. longo; caule laxe lanato; capitulis 3 dense aggregatis subsessilibus; involucro ca. 4 mm. alto; squamis basin versus furvis apice subfuscis, eis capitulorum fertilium lanceolatis acutis, eis capitulorum sterilium ellipticis obtusis, corolla rosea apice purpurea; pappo florum sterilium plus minus clavato; stylo valde exserto apice profunde bifido.

Dwarf, 3–6 cm. high; basal rosettes short-peduncled, erect or

sub-erect, their leaves narrowly spathulate, up to 1.6 cm. long and about 3 mm. wide, mucronate, densely appressed-tomentose on both sides; cauline leaves 3–4, linear, loosely lanate, their tips with a flat, scarious, glabrous, brown appendage 1.5–2.5 mm. long; stem loosely lanate; heads 3, densely clustered, subsessile; involucre about 4 mm. high, the bracts dark brown at the middle, brown to golden buff at tip; inner bracts of the pistillate heads linear lanceolate, acuminate; those of the staminate heads elliptic, obtuse; corolla of the pistillate flowers about 0.2 mm. wide, that of the staminate flower about 1 mm. wide, rose-coloured below, purplish above; pappus-bristles of the male flowers slightly clavate; style long-exserted, deeply 2-cleft.—Alaska: Near Port Clarence, field No. 1496, *F. A. Walpole*, July 20, 1901. Type (herb. Gray), sub nomine *A. monocephala* DC.

This species is closely related to *A. monocephala* DC. and has, like the latter, both male and female plants, whereas in all arctic American species except *A. pulcherrima*, only pistillate specimens have been observed. Like *A. monocephala, A. alaskana* is characterized by conspicuously small heads, a character easily separating the two from all other arctic American species of *Antennaria.*

Besides being pleiocephalous, *A. alaskana* differs from typical *A. monocephala* in having the rosette-leaves densely tomentose on both sides. In the true *A. monocephala* they are tomentose on the lower surface only.

5. A. isolepis Greene, Ottawa Nat. **25**, 1911, 41.—About 1–1.5 dm. high; basal rosettes well developed, procumbent, their leaves up to about 12 mm. long, oblanceolate, mucronate, tomentose on both surfaces, more densely so underneath; cauline leaves numerous, linear-lanceolate, loosely floccose-tomentose, the lowermost mucronate, the middle and upper with a narrowly elliptic, flat, scarious appendage about 2 mm. long; stem floccose-tomentose; heads several; involucre 6–7 mm. high; inner bracts with an oblong, pale brown to whitish, obtuse or slightly acutish tip. Only the female plant known.—Labrador: Okkak, ex. Herb. *John Ball*, 1890 (neither date nor collector; No. 83a, Port Manvers, Aug. 11, 1900, *E. B. Delabarre;* No. 421, Head of Nachvak Bay, Aug. 17, 1926, *R. H. Woodworth;* No. 155, Ramah, July 15–Aug. 20, 1894, *A. Stecker;* No. 422, Head of Ryan's Bay, Aug. 24, 1926, *R. H. Woodworth;* No. 592, Cape Harrigan, Aug. 12, 1928, *H. Bishop;* Kikkertaksoak, Saglek Bay, Aug. 10, 1931, *E. C. Abbe.* (All in Gray). Saglek Bay, Aug. 23, 1925, *R. A. Bartlett.*[1] Northwest Territories, Keewatin: No. 79,270, Cape Eskimo, west coast of Hudson Bay, Lat. 61° 5′, *J. M. Macoun;* upper Maguse River, about Lat. 62° 40′, Long. 95° 10′. 1932, *W. Gussow;* Kingaryuaik, Lat. 61° 50′, Long. 95° 24′, 1932 *W. Gussow.* Manitoba: Long Point, Lat. 59° 21′, Long. 94° 40′, 1932, *W. Gussow.*

[1] The Labrador localities are all in the Torngat Region.

6. A. PYGMAEA Fernald, RHODORA, **16**, 1914, 129. *A. carpathica* Gray, Syn. Fl. N. Am. **1**, 1884, 232 (Labrador plant), non (Wg.) R. Br.—From 3 cm. to about 1 dm. high; basal rosettes short, erect or suberect; their leaves oblanceolate, mucronate, from 8 to about 15 mm. long, 2.5–3.5 mm. wide, glabrous or glabrate above, loosely tomentose beneath; cauline leaves linear-oblanceolate, glabrous or glabrate above, lanate beneath, tipped with a flat, glabrous, scarious, deltoid appendage 1.5–2 mm. long; heads normally solitary; involucre 6–7 mm. long, innermost bracts with an oblong, obtuse, white to stramineous tip. Only the female plant known.—LABRADOR: (ex Herb. J. Gay, *Fratres Moravic.*); Okak, *Weiz;* No. 419, Razorback Mt., Ryan's Bay, Aug. 25, 1926, *R. H. Woodworth;* No. 420, Head of Nachvak Bay, Aug. 17, 1926, *R. H. Woodworth;* No. 558, Valley of the Twin Falls, Cape Mugford Peninsula, July 17, 1931, *E. C. Abbe;* No. 559, Rowsell Harbour, July 20, 1931, *E. C. Abbe;* No. 560, "K" River, Kangalaksiorvik, Lat. 59° 18′, Long. 63° 45′, July 22, 1931, *E. C. Abbe;* No. 561, Base of "K-2," north side of Komaktorvik, July 24, 1931, *E. C. Abbe.*[1] (All in Gray). QUEBEC: Nos. 120,111, 120,108, Port Burwell, Hudson Strait, July 25–28, 1928, *M. O. Malte.*

7. A. **canescens** (Lge.), n. comb. *A. alpina* (L.) Gaertn. β. *canescens* Lge. Fl. Dan., **16**, fasc. xlvii, 1869, tab. 2786, fig. 1.—Plant up to 1.5 dm. high; basal rosettes borne on normally well developed, prostrate or ascending stolons; their leaves up to about 1.5 cm. long, spathulately oblanceolate, acute, densely permanently and grayishly appressed-tomentose on both sides; cauline leaves linear-lanceolate, less tomentose than those of the stolons, the middle and upper with a glabrous, scarious appendage; heads normally 3, in a dense corymb; involucre 7–10 mm. high, lanate and green below, glabrous and dark brown above; middle and inner bracts linear-lanceolate, long-attenuate; style long-exserted, 2-cleft. Only female plant known.—LABRADOR: Nos. 552 and 553, "K" River, Kangalaksiorvik, July 22, 1931, *E. C. Abbe;* No. 554, Near Island, Seven Islands Bay, Kangalaksiorvik, Aug. 6, 1931, *E. C. Abbe;* No. 556 and 556a, Razorback Harbour, Lat. 59° 14′, Long. 63° 23′, Aug. 17, 1931, *E. C. Abbe;* No. 414, Razorback Mt., Ryans Bay, Aug. 23, 1926, *R. H. Woodworth;* No. 413, North shore of Duck Bight, 1 km. north of Ryan's Bay, Aug. 24, 1926, *R. H. Woodworth;* Port Manvers, Aug. 11, 1910, *E. B. Delabarre;* Okkak, Aug. 1911, *F. C. Hinkley;* no locality, 1865, *Baush;* No. 74, Nain, June 28–July 30, 1928, *C. S. Sewall* (Rawson-MacMillan Subarctic Expedition, 1927–28); No. 415, Head of Main Arm of Ekortiarsuk Bay, Aug. 20, 1926, *R. H. Woodworth;* near Hebron, Mentzel (ex. Herb. J. Steetz); No. 411, Head of Nachvak Bay, Aug. 17, 1926, *R. H. Woodworth;* No. 412, Kikkertasak Island, Saglek Bay, Aug. 9, 1926, *R. H. Woodworth.*[2] QUEBEC: No. 120,087, Port Burwell, Hudson Strait, July 25–28, 1928, *M. O. Malte.* BAFFIN ISLAND: No. 119,192, Lake Harbour, Aug. 25–26, 1927, *M. O. Malte.*

[1] The Labrador localities are all in the Torngat Region.

[2] All the Labrador localities are in the Torngat region.

Dwarfed specimens growing on exposed rocks often have the stolons poorly developed and may then be taken for *A. congesta*. In the latter, however, the rosette-leaves become glabrate or glabrous above in age; the involucre is uniformly dark brown and the middle bracts broadly lanceolate to ovate, acute.

Sometimes monocephalous specimens are found. Such specimens differ from other monocephalous species as follows: from *A. nitens* in having a dense tomentum, from *A. pygmaea* in the dark-tipped, long-attenuate bracts, from *A. Sornborgeri* in the higher involucre, from *A. burwellensis* in the middle bracts which in the latter are broadly lanceolate to ovate-lanceolate, from *A. angustata* in the same character, and in the rosette-leaves which in the latter become glabrate or glabrous above when mature, and form *A. hudsonica* in the rosette-leaves which in the latter become glabrate or glabrous above in age.

8. A. **arenicola**, n. sp. Planta 1–2 dm. alta; sarmentis prostratis vel adscendentibus, usque ad 4 cm. longis; foliis eorum lineari-oblanceolatis, mucronatis, strigoso-tomentosis, supra tarde glabris; foliis caulinis 6–8, distantibus, linearibus, lanatis, inferioribus mucronatis, superioribus apice scarioso, glabro, anguste oblongo; caule lanato; capitulis 3 vel pluribus; involucro ca. 7 mm. alto, basi lanato; squamis mediis intimisque linearibus, longe attenuatis, parte superiore subfuscis; stylo longe exserto, profunde bifido. Planta mascula ignota.

Plant 1–2 dm. high; basal rosettes borne on well developed stolons; their leaves linear-oblanceolate, up to 1.5 cm. long, mucronate, dull strigose-tomentose, tardily becoming glabrous above; stem leaves 6–8, distant, linear, lanate, the lower mucronate, the upper tipped with a scarious, glabrous, narrowly oblong appendage; stem lanate; heads normally 3 or more; involucre about 7 mm. high, lanate at base; inner bracts linear, long-attenuate, light brown in the upper part; style long-exserted, deeply 2-cleft.—Quebec: No. 120,714 (Nat. Herb. Can.), Type, Sandy flat, Port Harrison, east coast of Hudson Bay, Aug. 18–20, 1928, *M. O. Malte*.

Occasionally monocephalous individuals occur. Such specimens are readily distinguished from *A. Sornborgeri* on the tomentum of the rosette-leaves which in the latter is appressed-pannose, not at all strigose, and from *A. burwellensis* on the shape of the bracts. In *A. arenicola* the inner ones are linear and long-attenuate; in *A. burwellensis* they mostly are lanceolate, acute or acuminate.

A northern Labrador species, *A. ungavensis*[1] is somewhat similar to

[1] A. **ungavensis** (Fernald), n. comb. *A. alpina* (L.) Gaertn. var. *ungavensis* Fernald, Rhodora, **18**, 1916, 238.

A. arenicola in general appearance. The most conspicuous differences between the two are that in *A. arenicola* the rosette-leaves are dull strigose-tomentose below and become glabrous above very tardily, whereas in *A. ungavensis* the rosette-leaves are silky tomentose below and green and glabrous above practically from the beginning. *A. ungavensis* is known only from the type locality, Stillwater River, about half way between Richmond Gulf, Hudson Bay, and Ungava Bay, Hudson Strait, far to the south of the tree line.

9. A. SORNBORGERI Fernald, RHODORA, **18**, 1916, 237.—Plant up to about 1 dm. high; basal rosettes on short, prostrate or ascending stolons; their leaves oblanceolate, 6–12 mm. long, 1.5–2 mm. wide, pannose-tomentose, narrowed at summit to the short-mucronate apex; cauline leaves linear, the upper with lanceolate, scarious tips; heads normally solitary; involucre 6–7 mm. high; outer bracts lanceolate, brown, the inner linear to linear-lanceolate, long-attenuate, light brown; pits of the denuded receptacle 60–100, 0.1 mm. broad, about as wide as the blunt-edged intermediate ridges. Only female plant known.—LABRADOR: No. 156, Ramah, Lat. 58° 54′, Aug. 20–24, 1897, *J. D. Sornborger*.

10. A. **burwellensis**, n. sp. Planta 5–8 cm. alta; sarmentis prostratis vel adscendentibus, usque ad 3 cm. longis; foliis eorum ca. 1 cm. longis, oblanceolatis, utrinque laxe strigoso-tomentosis, mucronatis; foliis caulinis linearibus, sparse lanatis, apice plano scarioso glabro 1–2 mm. longo; caule lanato; capitulis solitariis; involucro ca. 6 mm. alto, basi lanato, fusco, parte superiore glabro, subfusco; squamis mediis late lanceolatis vel ovato-lanceolatis, acutis, intimis linearibus vel lineari-lanceolatis, acutis vel acuminatis; stylo parum exserto, bifido. Planta mascula ignota.

Plant 5–8 cm. high; basal rosettes borne on prostrate or ascending stolons up to about 3 cm. long; their leaves about 1 cm. long, oblanceolate, loosely strigose-tomentose on both sides, mucronate; cauline leaves linear, sparsely lanate, tipped with a flat, scarious, glabrous, 1–2 mm. long appendage; stem lanate; normally monocephalous; involucre about 6 mm. high, lanate and dark or greenish brown at base, glabrous and pale brown at the top; the middle bracts broadly lanceolate to ovate-lanceolate, acute, the inner ones linear-lanceolate to lanceolate, acute or acuminate; style little exserted, 2-cleft. Only female plant known.—QUEBEC: No. 120,125 (Nat. Herb. Can.), TYPE, Port Burwell, Hudson Strait, July 25–28, 1928, *M. O. Malte*.

11. A. **compacta**, n. sp. *A. candida* Macoun & Holm, Rpt. Can. Arct. Exp. 1913–18, **5**, Pt. A., 1921, 21; non Greene, Leaflets **2**, 151.—Planta nana, 4–5 cm. alta albo-tomentosa; sarmentis numerosis, dense aggregatis, brevibus, erectis vel suberectis, foliis eorum spathulato-oblanceolatis, utrinque satis strigoso-tomentosis; mucronatis sed mucrone tomento abdito; foliis caulinis laxe tomentosis, apice scarioso

glabro ca. 2 mm. longo, eo foliorum inferiorum lineari-lanceolato, eo foliorum superiorum oblongo; caule lanato-tomentoso; capitulis 3, dense corymbosis; involucro 6–7 mm. alto, basi lanato, atro-olivaceo; squamis interioribus apice late lanceolato, serrulato, satis abrupte acuto; stylo exserto, profunde bifido. Planta mascula ignota.

Dwarf, 4–5 cm. high, white-tomentose, basal rosettes numerous, densely crowded, short, erect or suberect; their leaves spathulately oblanceolate, densely and loosely strigose-tomentose on both surfaces, mucronate, but the mucro completely hidden by the tomentum and the leaves therefore appearing obtuse; cauline leaves loosely tomentose, the lower with linear-lanceolate appendages, the upper with oblong ones, the appendages scarious, glabrous, about 2 mm. long; stem lanate-tomentose; heads 3, crowded, short-stalked; involucre 6–7 mm. high, woolly at base, dark olive; the tips of the inner bracts broadly lanceolate, serrulate, and rather abruptly acute; style exserted, deeply 2-cleft. Only female plant known.—Northwest Territories, Mackenzie: No. 91,545, Bernard Harbour. Lat. 68° 47′ N., Long. 114° 46′ W., *Fritz Johansen*, July 6, 1915, Type (Nat. Herb. Can.; part of type also in Gray Herb.).

12. A. **subcanescens** Ostenfeld in sched., n. sp. *A. alpina* Macoun & Holm, Rpt. Can. Arct. Exp. 1913–18, **5**, Pt. A, 1921, 21A, pl. xii. fig. 2, non Gaertn. Planta 5–12 mm. alta, subcano-tomentosa; sarmentis brevibus, erectis vel suberectis; foliis eorum satis late spathulato-oblanceolatis, usque ad 15 mm. longis 4 mm. latis, apice rotundatis obscure mucronulatis, mucrone tomento abdito, utrinque strigoso-tomentosis; foliis caulinis linearibus, apice plano, oblongo, scarioso, glabro ca. 2 mm. longo; caule sparse lanato; capitulis 3, dense corymbosis; involucro ca. 7 mm. alto, basi sparse lanato, furvo; squamis interioribus apice clariore, lineari-lanceolato, acuminato vel attenuato; stylo exserto, profunde bifido; planta mascula ignota.

Plant 5–12 cm. high, greyish-tomentose; basal rosettes short, erect or suberect; their leaves rather broadly spathulate-oblanceolate, up to 15 mm. long and 4 nm. wide, rounded and obscurely mucronulate at apex, the mucro hidden by the tomentum, strigose-tomentose on both surfaces; cauline leaves linear, tipped with flat, oblong, scarious, glabrous appendages about 2 mm. long; stem sparsely lanate; heads 3, in a dense corymb; involucre about 7 mm. high, slightly lanate and dark brown at base; tips of the inner bracts lighter, linear-lanceolate, acuminate or attenuate; style exserted, deeply 2-cleft. Only female plant known.—Northwest Territories, Mackenzie: No. 91,546, Bernard Harbour, Lat. 68° 45′ N., Long. 114° 46′ W., *Fritz Johansen*, Aug. 14, 1915, Type (Nat. Herb. Can.).

13. A. labradorica Nutt., Trans. Am. Philo. Soc. **7**, 1841, 406. *A. angustifolia* Elis. Ekman, Svensk Bot. Tidskr., **21**, 1927, 53; non *A. angustifolia* Rydb., Bull. Torr. Bot. Club, **26**, 1899, 546. *A. Friesiana* Elis. Ekman, Svensk Bot. Tidskr. **22**, 1928, 416, as to plant discussed, not as to type, *A. alpina* var. *Friesiana* Trautv.,

Acta Hort. Petrop. **6**, 1878, 24.—Plant densely caespitose, from a few cm. to about 2 dm. high; basal rosettes sessile or subsessile, erect or suberect; their leaves up to about 2 cm. long, densely and somewhat silvery strigose-tomentose on both sides, linear-oblanceolate, mucronulate, but the mucro often hidden by the tomentum; stem and stem-leaves lanate, the latter tipped by a flat scarious, glabrous appendage 1–2 mm. long, or the lowermost mucronate; heads generally 3 in a corymb, when more then in a more open inflorescens; involucre lanate at base, about 7 mm. high; tips of the inner bracts linear to linear-lanceolate, long-attenuate, generally light chocolate brown, but sometimes more or less olivaceous; pappus subrufescent; style exserted, deeply 2-cleft. Only female plant known.—LABRADOR: No. 550, Valley of the Twin Falls, Cape Mugford Peninsula, Lat. 57° 50′, Long. 61° 50′, July 17, 1931, *E. C. Abbe* (Gray). BAFFIN ISLAND: No. 303, Rawson-MacMillan Subarctic Expedition, 1927–28, Frobisher Bay, Aug. 1927, *C. S. Sewall* (Gray); No. 52, MacMillan Expedition, 1922, Seal Harbour, July 31, 1922, *R. Robinson* (Gray); Nos. 119,194, 119,189, Pangnirtung, Cumberland Gulf, Aug. 21–22, 1927, *M. O. Malte;* No. 119,184, Arctic Bay, Admiralty Inlet, Aug. 12, 1927, *M. O. Malte.* MELVILLE ISLAND: Parry's 1st Voyage, 1819–20 (ex Herb. Mus. Brit.) (Gray). NORTHWEST TERRITORIES, KEEWATIN: No. 79,268, Wager Inlet, Hudson Bay, Lat. 65° 15′, Sept. 8, 1910, *M. O. Malte.*

What *A. labradorica* Nutt. really is, has long been a mystery, and it was first in 1930, when a few fragments from Nuttall were found in the herbarium of the British Museum of Natural History, that its true identity became established. It is a strikingly distinct species, described in 1927 by Mrs. Elizabeth Ekman under the name of *A. angustifolia* (see Fernald, RHODORA, **33**, 1931, 224).

Discovering that the name *A. angustifolia* was invalid on account of an earlier *A. angustifolia* Rydb., and having examined Siberian material of *A. alpina* (L.) Gaertn., var. *Friesiana* Trautv., Mrs. Ekman later came to the conclusion that her *A. angustifolia* was identical with Trautvetter's variety. She therefore adopted Trautvetter's name, at the same time raising the variety to specific rank (Sv. Bot. Tidskr. **22**, 1928, 416).

A. alpina var. *Friesiana* was described from specimens collected at the Kolyma River in North Siberia by I. Augustinovitsch. Through the kindness of Dr. G. Samuelsson, Stockholm, Sweden, the writer has had an opportunity to examine a specimen of Augustinovitsch's Kolyma collection, deposited in the "Riksmuseum," Stockholm, Sweden. This specimen is not identical with *A. angustifolia* Elis. Ekman. Neither is it identical, as far as the writer has been able to

ascertain, with any other *Antennaria* so far known, from either North America or Greenland. It differs from *angustifolia* in several respects. In the first place, the tips of the inner bracts are broadly lanceolate, acute or acuminate, whereas in *angustifolia* they are linear to linear-lanceolate, long-attenuate. The basal leaves are linear, much narrower than in *angustifolia*, and with a tendency to become glabrate above in age, dull and not at all silvery as in the latter. Furthermore, they are very prominently mucronate, the mucro reaching a length of almost 1 mm.

Lately Mrs. Ekman has realized that her *A. angustifolia* is identical with Nuttall's *A. labradorica*, as is indicated by revision labels on the Stockholm material, written by Mrs. Ekman herself.

A. labradorica was much misunderstood by Greene. When describing *A. neodioica* (Pittonia, **3**, 1897, 184) he says that "there is a possibility that *A. neodioica* may be the plant intended by Nuttall as *A. Labradorica*." This is a wild guess and far from the mark and perhaps dimly realized as unwarranted by Greene himself, for he qualifies his surmise by adding that "our plant does not answer to his (Nuttall's) description."

A few months later, Greene (Pittonia, **3**, 1898, 284) made another unfortunate guess at the identity of Nuttall's *A. labradorica* when he identified it with specimens collected in 1896 by W. Spreadborough at Stillwater River, northern Labrador (now part of the Province of Quebec, Canada). These specimens No. 44,442, Nat. Herb. Can., are stoloniferous, which *A. labradorica* is not, and the broad rosette-leaves are green and glabrous above. Furthermore, they are monocephalous or falsely pleiocephalous (see page 000). The Stillwater River plant was described by Fernald (Rhodora **18**, 1916, 238) under the name of *A. alpina* var. *ungavensis* and raised by the writer to specific rank (page 110).

14. A. **congesta**, n. sp. Planta 2–8 cm. alta; sarmentis sessilibus vel subsessilibus erectis vel suberectis; foliis eorum 1–1.5 cm. longis, lineari-oblanceolatis, apice abrupte contractis, mucronatis, subtus laxe lanato-tomentosis, superne aetate glabrescentibus vel glabris; foliis caulinis linearibus, subtus lanatis, superne glabratis vel glabris, inferioribus mucronatis vel lineari-appendiculatis, superioribus apice scarioso, plano, glabro, oblongo, 1.5–2.5 mm. longo munitis; caule lanato; capitulis plerumque 3, densissime corymbosis; involucro basi lanato, 7–10 mm. alto; squamis mediis lanceolatis interioribus lineari-lanceolatis, longe attenuatis, fere olivaceis apice pallidiore; stylo longe exserto, bifido. **Planta mascula ignota.**

Dwarf, 2–8 cm. high; basal rosettes sessile or subsessile, erect or suberect; their leaves 1–1.5 cm. long, linear-oblanceolate, abruptly contracted towards the mucronate apex, loosely lanate-tomentose below, in age becoming glabrate or glabrous above; cauline leaves linear, lanate below, glabrate or glabrous above, the lowermost mucronate or with a linear appendage, the uppermost with a scarious, flat glabrous, oblong appendage 1.5–2.5 mm. long; stem lanate; heads generally 3, very densely congested; involucre lanate at base, 7–10 mm. high; middle bracts lanceolate, and inner ones linear-lanceolate, long-attenuate, almost olivaceous, with paler tips; style long-exserted, 2-cleft. Only female plant known.—QUEBEC: No. 120,118, TYPE; Port Burwell, Hudson Strait, July 25–28, 1928, *M. O. Malte*.

Occasionally occurring monocephalous specimens differ from *A. hudsonica* in having the rosette-leaves very abruptly contracted towards the apex and lanate-tomentose below, in the generally much shorter appendages of the uppermost cauline leaves, and in the broader middle bracts.

15. A. ANGUSTATA Greene, Pittonia **3**, 1898, 284. Dwarf, 2–4 cm. high; basal rosettes sessile or subsessile; erect or suberect; their leaves about 1 cm. long, narrowly oblanceolate, mucronate, strigose-tomentose below; becoming glabrate or even glabrous above, cauline leaves linear-lanceolate, lanate below, glabrous above, the scarious, flat, glabrous, oblong appendage of the upper ones about 3 mm. long; stem lanate, heads solitary; involucre slightly lanate below, 8–9 mm. high; the lowest bracts oblong, rounded at apex, greenish to light brown; middle bracts ovate-lanceolate to lanceolate, acute, irregularily toothed; innermost bracts linear, long-attenuate, often cuspidate, much exceeding the middle ones; both middle and inner bracts dark olivaceous; style included or short-exserted. Only female plant known.—LABRADOR: Nos. 416½ and 416, Head of Ryan's Bay, Aug. 24, 1926, *R. H. Woodworth;* No. 546, Near Island, Seven Islands Bay, Kangalaksiorvik, Lat. 59° 18′, Long. 63° 40′, Aug. 6, 1931, *E. C. Abbe;* No. 548, Razorback Harbour, Lat. 59° 14′, Long. 63° 23′, Aug. 17, 1931, *E. C. Abbe;* No. 540 and 540a, "K" River, Kangalaksiorvik, July 22, 1931, *E. C. Abbe;* No. 542, Mt. Tetragona, July 26, 1931, *E. C. Abbe;* No. 539, Rowsell Harbour, Lat. 58° 58′, Long. 63° 15′, July 20, 1931, *E. C. Abbe;* Nos. 545 and 545a, Peak "19," The Four Peaks, Lat. 59° 25′, Long. 63° 55′, Aug. 4, 1931, *E. C. Abbe;* Nos. 541 and 541a, Summit of "K-2," Komaktorvik, July 24, 1931, *E. C. Abbe;* Nos. 409 and 410, Nachvak Bay, Aug. 16 and 17, 1926, *R. H. Woodworth;* No. 544, Scree slide from top of Precipice Ridge to Komaktorvik Lake, July 29, 1931, *E. C. Abbe;* No. 410⅓, Head of Main Arm of Ekortiarsuk Bay, Aug. 10, 1926, *R. H. Woodworth;* Kangaksiorvik Bay, Sept. 1–10, 1908, *Owen Bryant* (Bryant Labrador Expedition, 1908).[1] QUEBEC: No. 11,248, Cape Chudleigh, Hudson Strait, Aug.

[1] All the above localities are in the Torngat region.

5, 1884, *R. Bell;* No. 62,999, Port Burwell, Hudson Strait, July 29, 1904, *L. E. Borden;* No. 79,271, Port Burwell, Hudson Strait, July 18, 1910, *J. M. Macoun;* Nos. 120,040, 120,079, 120,171, 120,095, Port Burwell, Hudson Strait, July 25–28, 1928, *M. O. Malte;* No. 34,739, Cape Wales, Hudson Strait, about Long. 72°, no date, no collector's name; No. 23,012, opposite Digge's Island, Hudson Strait, about Long. 77°, Aug. 3, 1898, *A. R. Low.* Baffin Island: No. 18,744, North shore of Hudson Strait, Aug. 1897, *R. Bell;* No. 119,190, Lake Harbour Aug. 25–26, 1927, *M. O. Malte;* No. 121,370, Pangnirtung Fiord, Cumberland Gulf, July 26, 1924, *J. D. Soper;* Nos. 119,187, 119,188, Pangnirtung, Cumberland Gulf, Aug. 21–22, 1927, *M. O. Malte.*

16. A. **hudsonica** n. sp. *A. glabrata* (J. Vahl) Greene, f. *tomentosa* Elis. Ekman, Sv. Bot. Tidskr, **21**, 1927, 51. Planta 3–15 cm. alta; sarmentis sessilibus vel subsessilibus, erectis; foliis eorum ca. 1 cm. longis, lineari-oblanceolatis, apice satis gradatim contractis, mucronatis, subtus strigoso-tomentosis, superne aetate glabrescentibus vel glabris; foliis caulinis linearibus, subtus lanatis, superne glabratis vel glabris, summis apice scarioso, plano, glabro, oblongo, vel anguste deltoideo, usque ad 4 mm. longo; caule lanato; involucro basi lanato, ca. 7 mm. alto; squamis mediis interioribusque linearibus vel linearilanceolatis, longe attenuatis, apice subfusco; stylo exserto, bifido. Planta mascula ignota.

Plant 3–15 cm. high; basal rosettes sessile or subsessile, erect or suberect; their leaves about 1 cm. long, linear-oblanceolate, gradually contracted towards the mucronate apex, strigose-tomentose below, in age becoming glabrate or glabrous above; cauline leaves linear, lanate below, glabrate or glabrous above, the scarious, flat, glabrous, oblong or narrowly deltoid appendage of the uppermost one reaching a length of up to 4 mm.; stem lanate; involucre lanate at base, about 7 mm. high; middle and inner bracts linear to linear-lanceolate, long-attenuate, with light brown tips; style exserted, 2-cleft. Only female plant known.—Labrador: No. 417, Head of Main Arm of Ekortiarsuk Bay, Aug. 20, 1926, *R. H. Woodworth;* No. 418, Razorback Mt., Ryan's Bay, Aug. 23, 1926, *R. H. Woodworth;* No. 547, East Bay, Ikordlearsuk, Lat. 59° 55′, Long. 64° 24′, Aug. 12, 1931, *E. C. Abbe* and *N. Odell;* No. 549, Near Island, Seven Islands Bay, Kangalaksiorvik, Aug. 6, 1931, *E. C. Abbe* (Gray). Quebec: Nos. 119,185 (Type!), 119,186, Port Burwell, Hudson Strait, Aug. 30, 1927, *M. O. Malte;* No. 120,171, Port Burwell, Hudson Strait, July 25–28, 1928, Nos. 120,975 and 120,993, Wolstenholme, Hudson Strait, Aug. 26, 1928, *M. O. Malte;* Smith Island, east coast of Hudson Bay, Aug. 24, 1928, *M. O. Malte.* Baffin Island: Nos. 119,193, 119,191, Lake Harbour, Aug. 25–26, 1927, *M. O. Malte;* Nos. 120,332, 120,344, 120,382, Cape Dorset, Aug. 4, 1928, *M. O. Malte.* Northwest Territories, Keewatin: No. 120,507, Chesterfield Inlet, Aug. 8–11, 1928, *M. O. Malte.*

The writer believes that this species is identical with *A. glabrata* (J. Vahl) Greene f. *tomentosa* Elis. Ekman, a Greenland plant, a specimen of which has kindly been presented by Mrs. Ekman. The name *tomentosa* as given to a form of *A. glabrata* is of course quite appropriate but when applied to a species of such a genus as *Antennaria* it certainly is not. The writer has therefore, with reluctance, when raising *A. glabrata* f. *tomentosa* to specific rank, decided to abandon Mrs. Ekman's name and select another one, a procedure against which there is no international rule. As the species is widely distributed in the Hudson Strait and Hudson Bay regions, the name *hudsonica* has been choosen.

National Museum of Canada

A NEW PRIMULA FROM THE GRAND CANYON OF THE COLORADO

M. L. Fernald

(Plate 282)

When I studied[1] the North American species of *Primula* § *Farinosae* in 1928, the most southern member of the section then known in North America was the very distinct and highly localized *P. specuicola* Rydb., of cliffs of the Colorado River and its tributaries in southeastern Utah. Additional specimens have subsequently come to hand, including excellent flowering material supplied through the late Dr. Rydberg, but the range of the species has not been extended outside of the Colorado River area of Utah.

Shortly after my publication on the group Mr. Francis Welles Hunnewell collected on the North Rim of the Grand Canyon of the Colorado in Coconino Co., Arizona, a plant with the leaves much as in *Primula specuicola*. This, quite naturally, was temporarily identified with the plant from farther up the River; but now, a careful checking of its characters shows the plant from the Grand Canyon to be a second localized species with which it is a great pleasure formally to associate the name of its discoverer:

Primula (§ Farinosae) **Hunnewellii**, sp. nov. (tab. 282), planta *P. specuicolam* simulans; foliis spathulatis membranaceis subtus plus minusve farinosis 4–9 cm. longis 0.7–1.5 cm. latis sinuato-dentatis apice rotundatis; scapo filiformi glabro nitido 5.5–11.5 cm. alto;

[1] Rhodora, xxx. 59–77, 85–104 (1928).

involucri bracteis lineari-subulatis 2–4 mm. longis basi dilatatis vix gibbosis; floribus 3–10; pedicellis filiformibus adscendentibus vel arcuatis deinde 1.5–3 cm. longis; calycibus chartaceis plus minusve farinosis campanulatis 3–4 mm. longis 2–3.5 mm. diametro, lobis lanceolato-deltoideis 2–2.4 mm. longis minute ciliolatis; corollae tubo gracili 5–6 mm. longo limbo ca. 7 mm. diametro purpureo (?), lobis emarginatis; capsulis cylindricis 5 mm. longis valde exsertis; seminibus angulatis 0.6–0.8 mm. longis fulvescentibus rugulosis.—Arizona: limestone cliffs, North Rim, Grand Canyon, Coconino Co., August 19, 1928, *Francis Welles Hunnewell*, no. 10,883 (type in herb. F. W. Hunnewell, duplicate in Gray Herb.).

Primula Hunnewellii, as already stated, is nearest related to the rare *P. specuicola* Rydb., also of the Colorado Valley. From the latter it differs most strikingly in its very small calyx, only 3–4 mm. long, and its definitely exserted capsule; *P. specuicola* having the more herbaceous calyx 6–9 mm. long (fig. 3), with more attenuate lobes and greatly exceeding the capsule. In *P. specuicola*, likewise, the involucre is better developed, up to 1 cm. long. Whether there are any essential differences in the corolla can not yet be stated. Seeds from the type collection have been shared between Mr. Hunnewell, the Harvard Botanic Garden and the Royal Botanic Garden at Edinburgh (where is found the world's greatest collection of living Primulas). Should any of these germinate it will be possible later to report upon the fresh flowers. Plate 282 from a photograph made by Professor J. Franklin Collins and presented to Rhodora by Mr. Hunnewell, shows a single plant (fig. 1) of *P. Hunnewellii*, × 1, and beside it (fig. 2) a fruiting calyx, × 3; with a fruiting calyx of *P. specuicola* Rydb. × 3 (fig. 3) for comparison, from the type locality, Bluff City, southeastern Utah, *Eastwood*, no. 68.

Glottidium vesicarium in Oklahoma.—Specimens of *Glottidium vesicarium* (Jacq.) Harper were brought recently to the botany department by Dr. A. C. Shead. These plants were collected by Dr. Shead near Mannsville, Johnston County, October 8, 1933, where, according to the collector, they occur very locally, and chiefly near the highway. Johnston County lies just east of the south-central part of the state. To the writer's knowledge, this location constitutes the most northwesterly one known for the species, the previously known range being considered as from the Carolinas to Florida and west to Texas.

Being annuals, these leguminous plants elicited the usual surprise

because of their woody stems and unusual height—the specimens exceeding three meters.

Whether the plants are native, and possess an intermittent range to the Gulf, or have been introduced, is still a conjectural matter.—

George J. Goodman, University of Oklahoma, Norman, Oklahoma.

NOTES ON THE FLORA OF TENNESSEE: THE GENUS TRILLIUM

W. A. Anderson

The genus *Trillium*, including as it does some of the most attractive spring flowers, has always had considerable attention from botanists. More than a hundred years ago the greater number of eastern North American species had been introduced into Europe, where they were cherished as horticultural rarities. Illustrations, not only of the various species, but also of color-forms, appeared in the botanical and horticultural publications of the late 18th and early 19th centuries. As for the present day interest in *Trillium*, there have been within the past forty years four revisions of the genus or of sections of it;[1] two revisions of the Trilliums of particular regions;[2] a series of studies of the California Trilliums, involving the life-history of the plants, their frequent sterility, and production of monstrosities;[3] and a vast number of short notices, mostly concerned with teratological forms. In spite of all this publication, several points seem to have been overlooked concerning the taxonomy and nomenclature of this interesting genus, and there are certain problems which as yet await solution.

Though the genus *Trillium* is a small one, it is unusually complex. Many species exhibit a high degree of variability in size, in color, and in form. All the species with atropurpureous petals have light-colored allies, which may be recognized as forms or varieties, or which in some

[1] Small, J. K., *The Sessile-flowered Trillia of the Southern States*, Bull. Torr. Bot. Cl. xxiv. 169–175 (1897).

Rendle, A. B., *Notes on Trillium*, Journal of Botany, xxxix. 321–335 (1901).

Gleason, H. A., *The Pedunculate Species of Trillium*, Bull. Torr. Bot. Cl. xxxiii. 387–396 (1906).

Gates, R. R , *A Systematic Study of the North American Genus Trillium*, Ann. Missouri Bot. Gard. iv. 43–92 (1917).

[2] Peattie, Donald C., *Trillium in North and South Carolina*, Jour. Elish. Mitch. Soc. xlii. 193–206 (1927).

Friesner, Ray C., *The Genus Trillium in Indiana*, Butler Univ. Bot. Studies, Papers nos. 2 and 3 (1929).

[3] Goodspeed and Brandt, *Notes on the Californian Species of Trillium*, Univ. Calif. Pub. Bot. vol. vii, nos. 1–4 (1916–1917).

cases are given specific rank. In the group of large, broad-leaved, sessile-flowered Trilliums, the specific lines are particularly hard to draw. *Trillium Hugeri* and the plant described by Harbison as *T. luteum* are, respectively, the deep-red and greenish-yellow, sessile-flowered Trilliums of the Tennessee and North Carolina Appalachians. In the Ozarks and vicinity are *T. viride*, a green-petalled species, and a purplish-flowered variety which has been given specific rank as *T. viridescens*. These two are described as having narrower petals than does *T. Hugeri*, and as being slightly pubescent near the tops of the stems and on the veins of the leaves, but some individuals are hard to separate from the Appalachian plants. In California is a series of sessile-flowered Trilliums which is almost identical with these of the Ozarks and of the Appalachians, and which includes atropurpureous-, greenish-yellow-, and white-flowered forms, also narrow-petalled and broad-petalled plants. McBride[1] suggests the possibility that these are identical with the Appalachian species. In view of the fact that the floras of the two regions are unrelated, this seems unlikely, yet more study will be needed before the relationships of these plants is satisfactorily explained. It is small wonder that Elliott, in 1817[2] wrote of the genus *Trillium*, "Under great simplicity and conformity of habit, . . . it contains and conceals many species."

That field experience is desirable is an axiom of taxonomic procedure. Other lines of attack which might lead to a better understanding of the genus *Trillium* are:—

1. A study of growth in various parts of the plant during the flowering period, such as was made by Harbison[3] on *T. ludovicianum*.

2. A study of rootstock- and fruit-characters. The present investigation reveals that one section of sessile-flowered Trilliums may be set apart on rootstock-characters alone. Fruits are rarely collected, and apparently little attention has been paid to them.

3. Studies in hybridization. Gates[4] suggests hybrid origin of many strains within certain species, and Goodspeed[5] suggests that teratological variations may result from the heterozygous condition. Experimental proof of these statements should be attempted.

[1] McBride, J. F., Contr. Gray Herb. n. ser. lvi 19 (1918).

[2] Elliott, Stephen, Sketch of the Botany of South Carolina and Georgia, i. 430 (1817).

[3] Harbison, T. G., Biltmore Bot. Studies, i. 24 (1901).

[4] Gates, R. R., Ann. Mo. Bot. Gard. iv. *T. erectum* var. *album*, p. 54, and *T. luteum*, p. 46.

[5] Goodspeed, Univ. Calif. Pub. Bot. vii. 85 (1917).

Tennessee has so many species of *Trillium* within its borders that a study of them involves nearly all the species of the eastern United States. The following key includes all known species within this region excepting the southern *T. decumbens*, *T. ludovicianum*, and *T. pusillum*, and the middle-western *T. nivale*.

a. Flowers sessile....*b.*
  b. Rootstocks slender, horizontal; petals distinctly clawed; anthers arching over the stigmas....*c.*
    c. Leaves petioled; sepals reflexed.....6. *T. recurvatum.*
    c. Leaves sessile; sepals spreading.....7. *T. lanceolatum.*
  b. Rootstocks short and stout; petals variously shaped, but, if narrowed below, not into a distinct claw; anthers straight....*d.*
    d. Stamens about half the length of the petals....*e.*
      e. Petals about half the width of the sepals; stamens 1.5–2 mm. broad.....9. *T. stamineum.*
      e. Petals as wide as or wider than the sepals; stamens about 1 mm. wide.....1. *T. sessile.*
    d. Stamens not more than one third the length of the petals....*f.*
      f. Petals broadly spatulate, at least one of them mucronate. 8. *T. discolor.*
      f. Petals linear to broadly oblanceolate, usually acute or acuminate, rarely obtuse, but not spatulate....*g.*
        g. Leaves lanceolate to ovate, acute.....2. *T. maculatum.*
        g. Leaves broadly ovate to orbicular, acuminate....*h.*
          h. Entirely glabrous; petals narrowly to broadly oblanceolate....*i.*
            i. Petals atropurpureous.....3. *T. Hugeri.*
            i. Petals yellow.....4. *T. luteum.*
          h. Upper part of stem and veins on lower surfaces of leaves pubescent; petals linear.....5. *T. viride.*
a. Flowers peduncled....*j.*
  j. Ovary winged or angled; petals of one color....*k.*
    k. Petals lanceolate to ovate, spreading from the base; ovary usually dark-colored....*l.*
      l. Filaments 2–3.5 mm. long....*m.*
        m. Petals atropurpureous.....10. *T. erectum.*
        m. Petals white.....10a. *T. erectum* var. *album.*
      l. Filaments 5–10 mm. long.....11. *T. Vaseyi.*
    k. Petals lanceolate to oblong or obovate, their bases ascending, the upper part spreading; ovary light-colored....*n.*
      n. Filaments and anthers slender; flowers usually raised above the leaves.....12. *T. grandiflorum.*
      n. Filaments and anthers stout; flowers on cernuous or declined peduncles, below the leaves....*o.*
        o. Style present; stamens usually long and anthers curved; corolla revolute.....13. *T. Catesbaei.*
        o. Style absent; stamens short and straight; corolla spreading, not revolute....*p.*
          p. Peduncle about as long as the flower, curved downward.....14. *T. cernuum.*
          p. Peduncle almost as long as the leaves, straight, but declined beneath the leaves.....15. *T. Gleasoni.*
  j. Ovary not winged or angled; petals white, with a purple spot near the base.....16. *T. undulatum.*

1. Trillium sessile L. Sp. Pl. i. 340 (1753). *T. longiflorum* Raf.[1] Med. Fl. ii. 97 (1830). *T. rotundifolium* Raf. l. c. *T. tinctorium* Raf. l. c. 98. *T. isanthum* Raf. l. c. *T. membranaceum* Raf. l. c.—*T. sessile* grows in Pennsylvania, Virginia, Ohio, central Kentucky, Tennessee and Arkansas. In Tennessee it has been found only in the central part of the State. Kingston Springs, *Svenson*, no. 34. Nashville, *Wilkinson;* Lee's place (Nashville), Apr., 1878, *Gattinger*.

While Linnaeus included at least two species in his *Trillium sessile*, Small[2] and Rendle[3] have shown that the name is more properly applied to this small plant of the middle States. Yellow- or green-flowered plants often are present in colonies of the ordinary red-flowered plants.[4]

2. T. maculatum Raf. Med. Flor. ii. 103 (1830). *Solanum triphyllon flore hexapetalo* Catesby, Nat. Hist. Carol. t. 50. *T. sessile* L. in part. *T. sessile* Elliott, Sketch i. 426 (1817), as to plant described. *T. discolor* Chapman, Fl. Southern U. S. 478 (1860) and later editions, not Wray. *T. Underwoodii* Small, Bull. Torr. Bot. Cl. xxiv. 172 (1897) and in Fl. Se. U. S. 277 (1903). *T. lanceolatum* Boykin, var. *rectistamineum* Gates, Ann. Mo. Bot. Gard. iv. 48 (1917). *T. rectistamineum* (Gates) St. John, Rhodora xxii. 78 (1920). Perhaps *T. sessile*, var. *praecox* Nuttall, Trans. Am. Phil. Soc. v. 154 (1837).—Rhizome usually corm-like, erect or horizontal; stem 1–3.5 dm. high, smooth; leaves 6–11 cm. long, lance-ovate, with rounded base and acute tip, strongly mottled, mottling tending to form longitudinal stripes; sepals 2.5–5 cm. long, erect, lanceolate, acute; petals 3.5–6 cm. long, oblanceolate, acute; anthers about 13 mm. long, connective projecting; stigmas recurved.

Though this plant has been known as long, perhaps, as any species of *Trillium*, and was one of the first to be illustrated, it has been the subject of a great deal of misunderstanding. Even after Small clearly demonstrated its validity as a species and gave it a name,

[1] Many of the numerous species of *Trillium* proposed by Rafinesque are referable to the trivial variations which are so abundant in this genus. A number of them can be identified with well marked species, and where this is the case they are cited in synonymy in this paper.

[2] Small, J. K., *Sessile-flowered Trillia of the Southern States*, Bull. Torr. Bot. Cl. xxiv. 169 (1897).

[3] Rendle, A. B., *Notes on Trillium*, Jour. Bot. xxxix. 321 (1901).

[4] Peattie, Jour. Elish. Mitch. Soc. xlii. 197 (1927), considers *T. sessile*, var. *luteum* Muhl. to be one of these rather than the larger *T. luteum* (Muhl.) Harbison of North Carolina and eastern Tennessee. Harbison, however, makes it clear, from his study of plants in the Muhlenberg herbarium, that the name is properly applied to the more southern plant, and he published it properly in Biltmore Botanical Studies i. 22 (1901). Beyer, in Torreya xxvii. 83 (1927), publishes *T. sessile*, var. *viridiflorum*, a green-flowered form of *T. sessile*. That such forms have long been recognized is shown by the fact that in every edition of Gray's Manual except the first, the petals of *T. sessile* are described as "purple varying to greenish."

Gates described it as a variety of *T. lanceolatum*, which it only superficially resembles, and St. John raised it to specific rank under Gates' varietal name.

Among the numerous species of *Trillium* described by Rafinesque, this one is unmistakable, not so much by the description, as by the citation to Elliott. Rafinesque's description is as follows:

> 34. *Tr. maculatum* Raf. (*Tr. sessile*, Elliot.) Stem spotted, leaves sessile ovate acute, trinerve, spotted: calyx erect oblong, petals spatulate, twice as long, dark purple. In Carolina, &c.

Elliott's Latin diagnosis is a direct quotation from Pursh: "T. flore sessili, erecto; petalis lanceolatis, erectis, calyce duplo longioribus; foliis sessilibus, lato-ovalibus, acutis. Pursh, 1. p. 244." This might apply to any one of several sessile-flowered Trilliums, but Elliott's careful supplementary description leaves no doubt as to the plant involved:

> *Root* thick, solid, with rings on the circumference, which, perhaps, indicate each years growth. *Stem* herbaceous, 6–12 inches high, glabrous, spotted, with small decaying sheaths at base. *Leaves* 3 at the summit of the stem, ovate, or oval, acute, 5 nerved, the 2 exterior obsolete, curiously spotted. *Flowers* sessile on the summit of the stem. *Calyx* 3 leaved, leaves oblong, ovate, erect, glabrous, green. *Petals* spathulate, lanceolate, erect or connivent, twice as long as the calyx, dark purple. *Filaments* flat, rigid, not half as long as the calyx, dark purple. *Anthers* linear, attached to the sides of the filaments, pale purple. *Germ* superior, ovate, 3 angled. *Styles* short, expanding. *Stigma* obtuse. *Berry* glabrous, depressed, dark purple.
>
> Grows in rich, high lands. The only species found near the sea coast. Flowers March–April.

It is clear that by "filaments" Elliott meant both filaments and connective, and that the stamens were only one fourth as long as the petals. This is the diagnostic character which sets off *T. maculatum* and *T. Hugeri* from *T. sessile*. That Elliott's plant was not *T. Hugeri* is indicated by the fact that the leaves were "ovate, or oval, acute, . . . curiously spotted." *T. Hugeri* has broadly ovate, acuminate leaves which are not strikingly spotted. In addition to this Elliott gives the correct geographic data,—"the only species found near the sea coast."

There are no authentic records of *Trillium maculatum* in Tennessee. It is a plant of the coastal plain and piedmont regions from the Carolinas to Alabama and Mississippi.

3. Trillium Hugeri Small, Fl. Se. U. S. 277 (1903).—A plant of the Appalachians of the Carolinas and Tennessee, which may be dis-

tinguished from *T. maculatum* by its broader, less mottled leaves, but is less readily separable from *T. viride* of the Ozark region, and perhaps should be included in that species. Knoxville, *Scribner*, no 7553; Lookout Mountain, Apr. 29, 1906, *T. O. Fuller;* wet ravine near Emory River, Wartburg, May 22, 1929, *Jennison & Anderson* (this specimen had petals pale toward the tips like *T. viride*, but is glabrous); Nashville, *Wilkinson*, and in Apr., 1878, *Gattinger*.

4. T. LUTEUM (Muhl.) Harbison, Biltmore Bot. Studies. i. 22 (1901). According to Harbison, *T. sessile*, var. *luteum* Muhl. Cat. p. 38 (1813). *T. Underwoodii*, var. *luteum* McBride, Contr. Gray Herb. lvi. 19 (1918). *T. luteum*, var. *latipetalum* Gates, Ann. Mo. Bot. Gard. iv. 46 (1917). *T. Hugeri*, forma *flava* Peattie, Jour. Elish. Mitch. Soc. xlii. 199 (1927).—Stem 2–6 dm. high from a short, thick rootstock; leaves 6–14 cm. long, broadly ovate to orbicular, acuminate, mottled, smooth, or veins of lower surface scabrous; sepals 3–4 cm. long, lanceolate, blunt; petals 4–6 cm. long, narrowly to broadly oblanceolate, sometimes almost linear, often somewhat twisted toward the tips, greenish-yellow to almost a buttercup-yellow; stamens 1–1.5 cm. long, filaments very short, connectives broad and slightly projecting at the tip; flower delicately fragrant, lemon-scented.

This plant is the most abundant *Trillium* in the valley of East Tennessee where it grows in pure stands unmixed with any red-flowered form. It does, however, show considerable range of variability, and the extreme types approach other named "species" so closely that it becomes doubtful whether the distinction really exists or not. *T. luteum* is closest related to *T. Hugeri*, to which it is similar in every respect except in color; every part of the plant shows the yellow pigmentation instead of purple. A specimen with wide petals would fall under Gates' var. *latipetalum*. One with very narrow, greenish petals, if accompanied with scabrous veins on the leaves would pass for *T. viride*, and forms with twisted petals approach *T. decumbens* Harbison, at least in this respect.

McBride described *T. luteum* as a variety of *T. Underwoodii* because he confused that species with *T. Hugeri*. Through the courtesy of Dr. J. K. Small the writer has been able to examine type material of *T. Hugeri* and representative specimens of *T. Underwoodii*. There can be no doubt that *T. luteum* is more properly associated with the former species.

Near Wolf Creek, May 19, 1928, *Jennison;* Sevierville, Apr. 11, 1917, *Ainslie;* Love's Creek, Knox County, Apr. 1925, *Galyon;* Knoxville, rich soil, common, May, 1895, *Ruth;* foot of Clinch Mountain, Corryton, *Marjorie Shipe*, no. 1; Harriman, *Kearney*, no. 107; Grand View, 1897, *R. W. Taylor*. A specimen of *Gattinger's*, from

Nashville, Apr. 1878, which is labelled *T. sessile*, var. *discolor* may belong to this species, though it is very faded, and could equally well be *T. Hugeri* or *T. viride*.

5. T. VIRIDE Beck, Amer. Jour. Sci. ix. 178 (1826). *T. viridescens* Nuttall, Trans. Am. Phil. Soc. v. 155 (1837). *T. sessile*, var. *Nuttallii* Watson, Proc. Am. Acad. Sci. xiv. 273 (1879).

As represented by specimens in the Gray Herbarium, plants from Missouri and Arkansas have stamens which are actually and proportionally longer than those of narrow-petalled specimens of *T. Hugeri* from Tennessee. The original description of *T. viride* states that the stamens are "half the length of the corol," but in specimens the writer has seen they are nearer one third. Most specimens of *Trillium* are mounted in such a way that the upper parts of the stems and the undersides of the leaves can not be seen. *T. viride* is described as being pubescent on these parts, but a study of fresh or unmounted specimens will be necessary in order to ascertain the constancy of this character. Small[1] recognizes *T. viridescens* as a separate species, with solidly purple-red petals.

T. viride grows in Missouri and Arkansas, and according to Small, in North Carolina, Alabama and Mississippi. A specimen of *Gattinger's*, Nashville Apr., 1878, and one of *Scribner's*, Knoxville, May 18, 1889, may belong to this species.

6. T. RECURVATUM Beck, Am. Jour. Sci. xi. 178 (1828). *T. unguiculatum* Raf. Med. Bot. ii. 98 (1830). *T. unguiculatum* Nutt. Trans. Am. Phil. Soc. v. 154 (1837).—1.3–3 dm. high from a slender horizontal rootstock; leaves 6–9 cm. long, narrowed into a petiole which is 0.8–2 cm. long, blade broadly lanceolate to nearly orbicular; sepals 1.5–2.2 cm. long, lanceolate, reflexed so they lie close against the stem; petals 2.2–3.2 cm. long, erect, clawed; blade varying in width but usually lanceolate and acuminate; filaments 3–4 mm. long, anthers 6–10 mm. long, incurved at the tip; stigmas erect with recurved tips.[2]

As in other species of *Trillium* there is great variation in the shape of the petals. In southeastern Iowa a robust form with broad, scarcely clawed petals and nearly sessile leaves is very common. It would pass for a distinct variety or almost as a separate species, if it did not intergrade with typical plants in the same colony. A yellow form, *T. recurvatum*, forma *luteum* has been described by Clute[3] and also by Friesner.[4]

[1] Small, Fl. Se. U. S., 278 (1903).

[2] Robertson, Charles, Bot. Gaz. xxi. 271 (1896), says this arrangement of stigmas and stamens is for self pollination, that these flowers have lost their power to attract insects other than occasional beetles which feed on the pollen.

[3] Clute, Willard N., Am. Botanist xxviii. 79 (1922).

[4] Friesner, Ray C., Butler Univ. Bot. Studies, Paper 3: 29 (1929).

T. recurvatum is a species of the Mississippi valley from Michigan and Wisconsin southward to West Tennessee and Arkansas. Low woods in river bottom, Clarksville, Apr. 23, 1919, *Ainslie;* rich woods, *Bain*, no. 174; Jackson, Apr. 1893, *Bain;* Brighton, Tipton county, *Palmer*, no. 17317.

7. T. LANCEOLATUM Boykin ex Watson, Proc. Am. Acad. xiv 274 as syn. (1879); Small, Bull. Torr. Bot. Cl. xxiv. 174 (1897). *T. recurvatum* var. *lanceolatum* Wats. Proc. Am. Acad. Sci. xiv. 273 (1879). —Differs from *T. recurvatum* in having lanceolate, sessile leaves; sepals spreading, not reflexed; plant taller and more slender. It may be regarded as the representative of *T. recurvatum* in the Gulf States. It is not found in Tennessee.

8. T. DISCOLOR Wray ex Hook. Bot. Mag. lviii, t 3097 (1831) has spatulate yellow petals, of which at least one is apiculate.

9. T. STAMINEUM Harbison, Biltm. Bot. Stud. i. 23 (1901) has a very pubescent stem, and pubescent veins on the lower surfaces of the leaves; petals which are much narrower than the sepals, and very large, broad, purple stamens, which are almost as large as the petals.

Neither of these Trilliums has been reported from Tennessee. According to Small the former is found in the Carolinas and in Georgia, while the latter grows in Georgia, Alabama and Mississippi.

10. T. ERECTUM L. Sp. Pl. i. 340 (1753). *T. rhomboideum* Michx., Fl. Bor.-Am. 215 (1803). *T. acuminatum* Raf. Med Bot. ii. 99 (1830). *T. nutans* Raf. l. c. *T. flavum* Raf. l. c. 100.

The common, ill-scented Trillium of northeastern United States, ranges southward in the Appalachians to Tennessee. It is rare in the southern part of its range where it is replaced by the white-petalled var. *album*. Mt. Pisgah, May 27, 1928, *Hesler;* Shady Valley, May 4, 1928, *Jennison;* Rockwood, *Galyon*, no. 455; rich woods, Harriman, *Kearney*, no. 172.

10 a. T. ERECTUM, var. ALBUM (Michx.) Pursh, Fl. Am. Sept. i. 245 (1814). *T. rhomboideum*, β. *album* Michx. Fl. Bor.-Am 215 (1803).—Differs from *T. erectum* only in the color of the petals, which are white, or creamy in age, and in having no scent. Farther north light-colored plants of *T. erectum* have been reported, some of them true albinos, with all parts of the flower white or green. In the Great Smoky Mountains these plants have dark ovaries, although the petals are white. In certain localities they grow by thousands.—Glade below Indian Grave Flat, Gatlinburg, *Anderson & Jennison*, no. 861; Roaring Fork, Gatlinburg, *Anderson*, no. 813 (one specimen approaches *T. Vaseyi*); Mt. LeConte, Gatlinburg, *Galyon*, nos. 467, 484; Cades Cove Mountain, Blount County, *Anderson*, no. 889; woods, Hiwassee Valley, *Ruth*, no. 457; Knoxville, *Ruth*, no. 456.

11. T. VASEYI Harbison, Biltm. Bot. Stud. i. 24 (1901). This, the largest *Trillium* in America, is like a gigantic *T. erectum*, some stem 6 dm. high; leaves 2 dm. long; petals 8 cm. long, 5 cm. wide, crimson-

purple; filaments much longer than in *T. erectum*, 5–10 mm. long; anthers 9–15 mm. long. *T. Vaseyi*, forma *album* House, Muhlenbergia vi. 73 (1910) is the white-petalled form.—An endemic of the southern Appalachians, not common. Mt. LeConte, Gatlinburg, *Galyon*, no. 470; Gatlinburg, June 8, 1930, *Sharp;* low woods, Oliver Springs, *Anderson & Jennison*, no. 958; without locality, *Gattinger*.

12. T. GRANDIFLORUM (Michx.) Salisb. Parad. Lond. t. i (1806). *T. rhomboideum* γ. *grandiflorum* Michx. Fl. Bor.-Am. i. 216 (1803). The common, large-flowered, white Trillium of the northeastern States, very variable, but easily recognized by the slender filaments and petals ascending at the base. The leaves are usually contracted into a very short petiole; the extreme form has been described as a distinct variety, var. *lirioides* (Raf.) Victorin.[1]

T. grandiflorum is restricted to the mountains in Tennessee. Lemon's Gap, Cocke County, *Kearney*, no. 338; Thunderhead, *Galyon*, no. 453; Gatlinburg, *Anderson & Jennison*, no. 873, *Anderson*, no. 802; Cades Cove Mountain, Blount County, *Anderson & Hesler*, nos. 1219, 1220; Monroe County, head of Tellico River, Apr. 23, 1890, *Scribner;* rich bluffs on Emory River, Harriman, *Kearney*, no. 170; mountain sides, Sewanee, *Kirby-Smith*.

13. T. CATESBAEI Elliott, Sketch Bot. S. C. & Ga. 429 (1817). *T. stylosum* Nuttall, Genera N. Am. Pl. i. 239 (1818). *T. nervosum* Ell., l. c. *Delostylis cernuum* Raf. (based on *T. stylosum* Nuttall) Jour. de Physique lxxxix. 102 (1819). Constitutes the sub-genus *Delostylium* Raf. Med. Fl. ii. 102 (1830).

This beautiful species stands apart from all other Trilliums not only in that it has a distinct style, but that the anthers are large and curved, the filaments long and stout, and all segments of the perianth strongly revolute.

A native of the mountains of North Carolina, Georgia and Tennessee, usually found in dry, sandy soil. In Tennessee it is more common at altitudes from 1200 to 2500 feet. The presence of a station at Memphis is a most unusual situation, though it points to a relation with the coastal plain which is by no means uncommon. *T. nervosum* Ell. is a slender form.

This plant was illustrated by Catesby, and was included in *T. cernuum* by Linnaeus.

Cades Cove, *Anderson*, no. 1152; Cades Cove Mountain, *Anderson*, nos. 907, 915; Sunshine, (Kinzel Springs), *Andes*, no. 68; on ridge among pines, Kinzel Springs, *Anderson* 1248; Ducktown, *Kearney*, no. 102; Albrecht Grove (?), "4 miles from here" (Memphis), *Egeling*.

14. T. CERNUUM L. Sp. Pl. 339 (1753). *T. latifolium* Raf., *T. hamosum* Raf., *T. medium* Raf., *T. glaucum* Raf., Med. Fl. ii. 101

[1] Victorin, Fr. Marie, Contr. Lab. Bot. Univ. Montreal xiv. 30 (1929).

(1830).—Similar to *T. Catesbaei* in that the flower is produced below the leaves on a curved pedicel, differing from it in having shorter, straight stamens, no style, and shorter petals which are not strongly recurved. The leaves are usually rhombic.

The typical form of this plant has lanceolate, acute petals. It grows from Newfoundland down the Atlantic coast to Georgia. Inland it is represented by *T. cernuum* var. *macranthum* Eames & Wiegand[1] which is a more robust plant with obovate petals rounded at the tips. This stout plant is very much like *T. Rugelii* Rendle.[2] The descriptions do not match as to color; the anthers and ovaries of *T. Rugelii* are described as deep purple. This character is more like that of *T. erectum* var. *album*, but Rendle's excellent plate is very much like some specimens of *T. cernuum* var. *macranthum* in the Gray Herbarium. The only specimen seen from a Tennessee station is of var. *macranthum*.

Ducktown, May, *Gattinger*.

15. T. Gleasoni Fernald, Rhodora xxxiv. 21 (1932). *T. declinatum* (Gray) Gleason Bull. Torr. Bot. Cl. xxxiii. 389 (1906), not Raf. *T. erectum*, var. *declinatum* Gray, Man., ed. 5, 523 (1867).—This plant has a straight, declined petiole, not a curved one, the flower below the leaves; filaments short, about 2 mm. long. In Tennessee, according to Eames & Wiegand.[3]

16. T. undulatum Willd. Ges. Naturf. Fr. Neue Schr. iii. 422 (1801). *T. erythrocarpum* Michx. Fl. Bor.-Am. i. 216 (1803).—The well-known Painted Trillium of coniferous forests of northeastern North America, which is near its southern limits in the mountains of Tennessee. It only grows at relatively high altitudes in the southern Appalachians, where it is associated with the Fraser's fir-red spruce forest.—Rich mountain woods, Lemon's Gap, *Kearney*, no. 337; Wolf Creek, May 20, 1928, *Jennison;* Shady Valley, May 4, 1928, *Jennison;* Mt. LeConte, *Galyon*, no. 468; Mt. LeConte, 5000 ft. elev., *Anderson*, no. 1250; Ocoe Valley, May, 1859, *Gattinger*.

The State University of Iowa,
Iowa City, Iowa.

Lobelia Dortmanna in Aroostook County, Maine.—While on a botanical collecting trip in the northern part of Maine during the past summer I felt very fortunate in finding *Lobelia Dortmanna* Linné (Water Lobelia) growing in two localities. On August 20, 1933 I

[1] Eames & Wiegand, Rhodora xxv. 191 (1923).
[2] Rendle, Jour. of Bot. xxxix. 33 (1901).
[3] Rhodora xxv. 150 (1923).

found the plant growing in considerable abundance in from two to three feet of water along the south-western margin of Madawaska Lake in Township xvi, Range 4. At this time some of the plants bore both flowers and fruits. On August 21, 1933 I also found this same plant growing under similar conditions in Eagle Lake, Township xvi, Range 6, near the mouth of Fish River. Specimens were collected at the former locality, and will be found in my collection under number 343. These stations are north of the previously recorded limits of the species in Maine.—MAYNARD W. QUIMBY, Ithaca, New York.

GAULTHERIA PROCUMBENS L., forma **accrescens**, f. nov. (TAB. 283), corolla persistenti accrescenti deinde 1 cm. longa roseata.—MASSACHUSETTS: oak and pine woods near the Hyannis pumping station, Barnstable, October 28, 1933, *M. L. Fernald, A. R. Hodgdon, C. B. Ummanzio,* et al., no. 2667 (TYPE in Gray Herb., isotype in herb. New England Botanical Club).

This extraordinary form of the common Checkerberry is the discovery of a group of students on the annual field-trip of "Botany 7" to Cape Cod. The excessive rains of the summer and autumn had so raised the levels of the usually productive ponds that they were quite without the typical display of beach plants. Consequently, the drowning of the bordering thicket and a driving nor'easter combined forced our party back into the ordinarily uninteresting mixed oak and pitch pine woods, to gather mushrooms for dinner. Some of the students, still further departing from the serious purpose of the trip, began gathering and eating Checkerberries, when one of them found a plant with the large accrescent pink corolla. Search brought to light about 20 fruiting stems, all apparently from one mat, showing this peculiarity. All other colonies in the neighborhood were quite typical, having lost the white corolla.

In typical *Gaultheria procumbens* the fruit, after the early loss of the corolla, becomes subglobose, with the closely appressed calyx-lobes tightly closed down over the summit of the capsule. In forma *accrescens,* due to the persistence and enlargement of the corolla, the fruit is campanulate, with the calyx-lobes straight and not arching. Through the kindness and interest of Professor J. F. Collins, who has made the photograph, and Dr. A. M. Waterman of the Providence Office of Forest Pathology, one of the flowers was frozen and sectioned but no sign of fungus infection was found.—M. L. FERNALD & A. R. HODGDON, Gray Herbarium.

THE ORIGIN OF THE NAME LESPEDEZA

P. L. Ricker

In the year 1803, a work was published on the flora of North America as a result of the explorations in this country of André Michaux and his son François André-Michaux between 1785 and 1796.

In this work[1] was described a new genus of legume which was named Lespedeza and in a footnote it is given as named for "D. Lespedez, gubernator Floridae, erga me peregrinatorem officiossissimus," which may be translated as named for "D. Lespedez, Governor of Florida, on account of the greatest courtesy to me during my travels." This has been interpreted by later writers as protection furnished by the Governor, but Michaux's Journal apparently disproves this. There were no local conflicts with the Indians at that time and, according to the Journal, all of his trips were by boat with frequent landings and accompanied by his son, a negro purchased at Charleston, and two hired boatmen who were also armed with guns, which are mentioned on only one occasion when a salute was exchanged on approaching a settlement. The courtesies extended, as far as mentioned, were entirely social, beginning with an invitation to dine with the Governor and ladies soon after his arrival.

In connection with a study of the economic species of *Lespedeza* with Dr. A. J. Pieters of the U. S. Department of Agriculture, it seemed desirable to have a little more information regarding D. Lespedez and his relations with the elder Michaux. The Journal of the latter[2] indicates that he arrived at St. Augustine February 28, 1788, explored the immediate region to a distance of 50 to 100 miles radius, and left there May 27, 1788. In several places he refers to visits to or from "His Excellency the Governor," but in no place mentions him by name. The Governor took a great interest in his collections on the return from several trips, and visited him to see his material on at least one occasion.

It would seem probable that some of the early histories of Florida or of the Spanish possessions in this country would make some mention of the name of the Governor of Florida during that period, but a search of those available at the Library of Congress failed to reveal any

[1] Michaux, André. Flora Boreali-Americana, 2: 70. 1803.

[2] Published in the original French by C. S. Sargent, Proc. Amer. Philos. Soc. 26: 1–145. 1889.

such reference. A bibliography at the end of one of the histories did however state that numerous early manuscripts were in the library of the Florida State Historical Society at DeLand, and I am indebted to the Secretary, Mr. James A. Robertson of Takoma Park, Md., for the following information.

The Governor of East Florida from 1784 to 1790 was Vicente Manuel de Céspedes,[1] who resided at St. Augustine. Their earliest document mentioning him is from Havana and dated March 3, 1784, when he was governor elect and had not taken his post. Photostat copies of other documents written by him, from the Archives in Seville, are also in the library of the above Society.[2]

The name Lespedeza was evidently so printed through an error of the printer, of Michaux's son or of L. C. M. Richard of the Paris Museum who is generally credited with having done most of the botanical work on the collections of Michaux. This was possibly due to illegibility of some of Michaux's notes as the ship on which he returned to France was wrecked off the coast of Holland, but most of his collections and notes were recovered from the water.

It would be exceedingly unfortunate and confusing after over one hundred years' use of the name *Lespedeza* if a correction in spelling were made. Botanical rules do not require it.

Confusion would also be caused on account of the name *Cespedesia* of the Family *Ochnaceae* described by Goudot in 1844,[3] and named for Juan Maria Céspedes, professor of botany at Santa Fé de Bogotá.

Under the international botanical rules two generic names even if of similar origin but of a single letter difference in spelling, when it does not involve the gender of the terminating letter or letters, are valid.

It is however hoped that no over-enthusiastic botanist will seize upon this case as an opportunity to make a new name or correction sufficiently different in appearance to think he is entitled to place his name after all of the new combinations involved. This has unfortunately been done in one or two cases in recent years but such a practice

[1] In the old spelling the letter c was z.

[2] Later Dr. John Hendley Barnhart has called my attention to a short biographical note on Gov. Céspedez in Brevard, Caroline M. A history of Florida from the treaty of 1763 to our own times. Published by the Florida State Historical Society. 1924.

[3] Ann. Sci. Nat. III. 2: 368. 1844.

is not ethical, and is not warranted under any written or unwritten rules of botany.[1]

Bureau of Plant Industry,
Washington, D. C.

Hawaiian Mosses.[2] Mr. Bartram has rendered a notable service to bryologists in collecting into one compact octavo volume the hitherto widely scattered, and frequently almost inaccessible, information on the Hawaiian mosses. His descriptions are written from a study of authentic, often type, material and are models for completeness and detailed information. The manual describes 198 species and 26 varieties, of which 195 species are illustrated by excellent text figures by the author, although Mr. Bartram modestly refrains from stating this fact. Like the descriptions these figures are made from authentic, often type, material. In the case of more or less cosmopolitan species both text and figures have been drawn, except in a few instances, from specimens collected in Hawaii. Thus the manual becomes, in a sense, a volume of original descriptions and drawings of all known Hawaiian mosses.

The arrangement of families and genera follows closely that of Engler and Prantl: "Die natürlichen Pflanzenfamilien," edition of 1924–1925. The nomenclature is that adopted for mosses at the Cambridge International Congress of 1930, making Hedwig's "Species Muscorum" (1801) as the starting point. Abundant keys to genera and species help make a very workable manual for the amateur or professional bryologist. As might be expected in the case of isolated tropical islands, with mountains reaching 6000 feet altitude, there are many endemic species—said to be more than 50 per cent.

Twenty species and varieties are described as new. These are: *Fissidens hawaiicus, F. insularis, Dicranella hawaiica* var. *tomentella, D. rigidula, Holomitrium squarrifolium, Leucobryum gracile* var. *hamatum, Calymperes hawaiiense, Encalypta scabrata, Anoectangium haleakalea* var. *laxum, Trichostomum oblongifolium, Leptodontium brevicaule, Webera gracilescens, Bryum vino-viride, Daltonia pseudostenophylla, Fabronia degeneri, Thuidium plicatum* var. *brevifolium, Glossadelphus irroratus, G. acutifolius, Ectropothecium viridifolium, Isopterygium vineale.*—J. F. C.

Volume 36, no. 423, including pages 61–100 and plates 278–280 was issued 9 March, 1934.

[1] Under the International Rules, as amended in 1930, a new name which is so similar to an older one as to cause confusion is not allowed.—Eds.

[2] Manual of Hawaiian Mosses, by Edwin B. Bartram. Bulletin 101, Bernice P. Bishop Museum, Honolulu, Hawaii. June, 1933, pages 1–275, figures 1–195.

FIG. 1, PRIMULA HUNNEWELLII, × 1; FIG. 2, fruit, × 3.
FIG. 3, P. SPECUICOLA, fruit, × 3.

GAULTHERIA PROCUMBENS, forma ACCRESCENS, × 1.

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PROFUSE VEGETATION OF FLOWER HILL, NOVAYA ZEMLYA.

Rhodora

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. May, 1934. No. 425.

SOME GENERAL RESULTS OF RECENT NORWEGIAN RESEARCH WORK ON ARCTIC LICHENS[1]

B. Lynge

(Plates 284 and 285)

In 1921 the writer joined the Norwegian scientific expedition to Novaya Zemlya. The botanical results have been published by the Norwegian Academy of Science in Oslo. In 1926 he worked in Spitsbergen (Bell Sound). His large collections from this expedition have in part been determined, but the results have not yet been published. In 1929 he worked in North East Greenland as a member of the expedition, which the Norwegian Svalbard-og Ishavs-undersøkelser (the "Svalbard Office") equipped.

In addition to his own collections he has also (entirely or in part) determined the Arctic lichen collections of Th. M. Fries from Bear Island and Spitsbergen in 1868 and from West Greenland in 1871, and he has determined the lichens from several Norwegian expeditions to the Svalbard region and to East Greenland. Together with his friend P. F. Scholander he has worked up Scholander's lichen collections from North East Greenland from the Norwegian expedition of the year 1930. He has also had full access to the large Arctic lichen collections in Copenhagen (from Greenland), Helsingfors (Bering Strait), Stockholm (Spitsbergen and Eastern Siberia), and Upsala (Spitsbergen).

Compared with these Scandinavian herbaria the Arctic lichens of the other herbaria in the world are less important. And they are not

[1] Published with aid of a gift to Rhodora from Mr. Bayard Long.

always accessible, for several important herbaria have rules that restrict the loan of their material to other institutions.

As a result of these studies he has arrived at some general results on the distribution of Arctic lichens, which he would like to present to an American public. For they imply some suggestions on the little known lichen flora of the North American high mountains, especially on the nivale lichen flora of the Rocky Mountains.

Let us first consider the lichen flora of North East Greenland, from Scoresby Sound and northwards. The Second German Polar Expedition in 1870–71 was the first to collect lichens here. The expedition worked under extreme difficulties in this region, which was then very little explored. It was in reality almost unknown. Their lichens were determined by the German lichenologist G. W. Koerber, who identified 52 species in the collection. The next botanist on the area was the Danish Dr. N. Hartz in 1891. He chiefly worked in Scoresby Sound, about 70°–72° N., south of the German field of exploration. Dr. Hartz's very important paper, which has, perhaps, not been duly appreciated, contains interesting observations on the vegetation, the importance of the snow cover, and also on the lichens. His lichen results were remarkable. Deichmann Branth identified 190 species in his collections. During the Danish expedition in 1898–1902 Ch. Kruuse collected a few lichens near the outlet of Scoresby Sound, and especially in the Angmagsalik district, south of Scoresby Sound, about 66° N. His scientific interest was the vascular plants. The Swedish Nathorst expedition in 1899, in search of the aviator Andrée, completed our geographical knowledge of the large fjord system north of Scoresby Sound, now called Eirik Raude's Land. Their extensive topographical work left them but a very limited time for botanical research. Their few lichens were determined by Malme. The Danish "Danmark" expedition in 1906–08, under the command of Mylius Erichsen, devoted more time to lichens. Its botanist, Lundager, collected 68 lichens, identified by O. Galløe. The lichens were collected about Danmark Harbour, their headquarters (76° 25′ N.). Lichenological research was an important botanical object for the two Norwegian expeditions in 1929 and 1930. We worked in the fjord district between the Liverpool coast in the south and Cape Wynn in the north, near the well known Sabine Island.

The determination of crustaceous lichens requires an immense amount of microscopical work. There are many of them in our

large collections, and we (*i. e.* Scholander and myself) have as yet only been able to work up a part of them. But the determination of our larger lichens has been published (Lynge et Scholander: Lichens from North East Greenland, collected on the Norwegian Scientific Expeditions in 1929 and 1930. Oslo 1932).

We now have a fully representative collection of these lichens from North East Greenland. Its flora of "larger lichens," and also some genera of crustaceous lichens, is now so well known that it can be used as the basis for a comparison with the lichens of the same genera from other well explored Arctic regions. At the same time I have worked up the same genera in the almost inexhaustible treasures of undetermined Arctic lichens in the Oslo herbarium. I have also determined the same genera in Th. Fries's West Greenland collections, and I have revised the Copenhagen Greenland material of them. In this way I hoped to obtain really comparable material from large parts of the Arctic. For the small and often very inconspicuous lichens can only be extensively collected by trained lichenologists. Other botanists overlook them, even if they are excellent observers.

We now have good material of the larger lichens from the region between Ellesmere Land, west of Greenland (The Second Norwegian Arctic Expedition in the Fram, botanist: Simmons), across Greenland and Svalbard (the Spitsbergen region) to Franz Josef Land and Novaya Zemlya, and also from the Bering Strait district (the famous Vega expedition, botanist: Ernst Almquist, the lichens determined by Nylander and by Vainio).

Future expeditions will bring to light many additional facts on the lichen flora of these regions, also on the larger lichens. I may thus mention that in 1931 Scholander found *Physcia constipata* and fertile plants of *Dactylina ramulosa* in the North East Land of Svalbard. But, as it is, the available facts from these regions are supposed to be fully comparable.

Unfortunately our knowledge of the lichens of the Siberian coast west of the Bering Strait district is as yet insufficient. Several Swedish, Finnish and Russian expeditions have worked there. But much of the material still awaits determination, and other collections which have been determined are hardly large enough to be representative. In spite of important papers by Elenkin, Savicz, and others, I am of opinion that our knowledge of the lichen flora of this immense coast is still so incomplete that it would be misleading to use it for comparisons with the above mentioned regions.

Our knowledge of the lichens of the Canadian Arctic coast west of Ellesmere Land is so insignificant that we are obliged to pass over it in silence.

In 1929 all the East Greenland expeditions had to force their way through heavy pack-ice. Every day we risked having our ship destroyed. Should we succeed in getting through it? If so, how should we get back again to the sea and to our home? Such were our thoughts. We succeeded.

We were much astonished to find a land of almost constant sunshine. The penetrating Arctic gales, and all the fog, sleet and the icy cold rain, which we knew so well in Svalbard and in Novaya Zemlya, were entirely lacking during almost the whole summer. There was only one attack, and a serious one, towards the end of August.

The available data on the precipitation in North East Greenland are very incomplete. But we know that it is extremely low. Most probably there are many places in the desert of Sahara with a higher precipitation. The reason for this is supposed to be the high atmospheric pressure over the inland ice. The winds rush down the high, bold shores like the foehns of the Alps. From well known physical causes it becomes ever drier downwards. In the lowlands it is so dry that there is very little rain. The little precipitation they have comes during the winter as snow. There is hardly any rain during the time of vegetation. At the Norwegian meteorological station Myggbukta the annual precipitation is supposed to be about 300 mm.

Through the spring the moisture in the soil is sufficient. But during the month of July the ground dries up, the moisture evaporates, or it disappears in the ground. During August the ground becomes so dry that in the continental parts of the fjords we often saw salts that had been precipitated on the open surface of the soil. I have no remembrance of a day in Spitsbergen or in Novaya Zemlya when I returned from my excursion with dry feet. In Spitsbergen we often had to paddle for miles along the beach in order to find a spot that was dry enough for a tent camp. In North East Greenland there was no trouble whatever about such things.

The result of this dry climate is evident: a heath vegetation is developed. In July we find the beautiful flowers of *Cassiope tetragona* and *Arctostaphylos alpina* covering large areas, and *Empetrum nigrum* and *Betula nana* are common all over the land to the very shore

of the open sea. In the moist climate of Novaya Zemlya and Spitsbergen these plants are rare, in places lacking, plentiful only in some more continental parts, *e. g.* the inland end of Isfjorden (the Ice Fjord) in Spitsbergen.

It is not the object of the present paper to discuss the distribution of the Arctic Vascular plants. But I may perhaps be allowed another digression. According to Ostenfeld we know 181 species of Vascular plants from the Angmagsalik district, at 66° N. He records 169 different species from the mighty Scoresby Sound district, between 70°–72° N. Still farther north the two Norwegian expeditions in 1929 and 1930 obtained no less than 169 different species, exclusive of hybrids, in Eirik Raude's Land, between the Liverpool coast and Sabine Island, 73°–75° N.

These figures are not in every detail comparable. In the Norwegian records the genus *Draba* has been split up into narrower species than in the Danish records. But this difference is, on the whole, insignificant. The Vascular flora of the two southern regions has been quite as well explored as that of Eirik Raude's Land, by Kruuse and Hartz. Even with due allowance for the *Drabae* we find that the number of species is reduced by less than 10% from 66° N. to 73°–75° N., a distance that is about one-third of the distance between Angmagsalik and the North Pole.

This shows that the conditions of life must be very uniform on this enormous coast. Furthermore we know that several plants, as well as animals (the musk-ox, the polar wolf), must have immigrated to East Greenland by the northern route, north of Greenland. Few of them have reached the Angmagsalik district. They accordingly represent an extra contribution to the flora (and fauna) of the two northern districts, as compared with the flora (and fauna) of the Angmagsalik district. On the other hand the latter district has received elements that have not reached the northern regions, such as *Sedum acre* and others.

An Arctic traveller, who has had his experience in Spitsbergen and Novaya Zemlya, knows that the coast flora is poorer than is the flora of the more continental parts of the fjords. It will decrease again towards the inland end of the fjord if intensely glaciated. It is sufficient to compare the coast flora of Isfjorden (the Ice Fjord) in Spitsbergen with the rich flora of Sassen Valley and other continental valleys of the same fjord. We saw the same situation in Novaya

Zemlya. This is true for the Vascular plants and to some extent also for the lichens. But we must not forget that many lichens have an extreme need of nitrogen, and are, accordingly, restricted to the bird-cliffs of the coast. It is chiefly the southern lichens that retire from the coast. It might be suggested that the relatively rich flora of vascular plants in the northern districts in Greenland is due to the great areas of ice-free land along the immense fjords. Compared with them, the largest in the world, the fjords and the ice-free land of the Angmagsalik district are very small.

Arriving, with our former experience in the maritime eastern Arctic regions, we were much astonished to find a fairly rich flora along the coast in North East Greenland. Farther inland the flora varied in richness, on the friable chalky sandstones behind the diabases a rich flora, on the hard rocks a very poor one. At the inland end of the fjords it was decidedly poorer than on the coast, evidently due also to the dry, almost desert climate. It is, therefore, not probable that the great number of vascular plants in the northern fjords is due to the greater extent of the ice-free land.

In Novaya Zemlya these things are very different. We found 159 species of Vascular plants in Matotchkin Shar, a little more than 73° N., and only 70 species at Arkhangel Bay, just south of 76° N.

We must take into consideration the greater difference in the conditions of life between Matotchkin Shar and the intensely glaciated Arkhangel Bay district in Novaya Zemlya, as compared with Angmagsalik and Eirik Raude's Land in East Greenland. Yet I venture to suggest another factor, perhaps worthy of consideration: Time.

In the region covered by our work in Novaya Zemlya there was not a single northern species that was lacking in the southern districts. Geologists and botanists agreed in regarding the northern parts of Novaya Zemlya as a land that had risen much and received its vegetation in relatively recent time, geologically speaking. We got the impression of a vegetation marching northwards.

We do not know much of the rapidity of the migration of Arctic Vascular plants. Failure to produce seeds does not check migration. In Novaya Zemlya I was much interested in that question. The summer was favourable, and generally I found ripe seeds as far north as I found the plants themselves. Plants that did not produce "diaspores" (*sensu* Sernander) locally were scarce and rare. The competition for the ground between related plants cannot be great.

In the real Arctic a continuous plant cover is very rare. Almost every seed has a fair chance of finding a place for germination. But I have seen very few seedling plants there. Apart from *Koenigia islandica*, which is supposed to be annual also in the Arctic, we find the vivipa-rous grasses germinating, and some seedlings of the genera *Draba* and *Saxifraga*. Johannes Lid, the Norwegian expert on Arctic Vascular plants, has told me that he has seen seedlings of *Carex ursina* in Spitsbergen.

Are the Arctic seeds not capable of germinating or do the young seedlings meet so severe conditions of life at their start that they succumb? The case may be individually different for each species. From my own observation I might suggest the latter answer to be the more probable one. But this question requires exact experiments in Arctic biological stations, like so many other interesting questions on the biology of Arctic plants. We are much in need of such stations.

The rich development of runners of different kinds can only be of local importance for migration (grasses, *Carices*, *Saxifraga flagellaris* etc.). On the whole the propagation of the Arctic plants is supposed to be sufficient. But I find it probable that migration would be slow, as so many vital processes are in the Arctic. If that is so, the great number of species of Vascular plants in Eirik Raude's Land, North East Greenland, as compared with the Scoresby Sound district and Angmagsalik farther south, would suggest a considerable age for the North East Greenland flora.

We must not forget that there is a great difference between the number of species and the number of individuals. Though the number of species is almost identical over this enormous distance, it is sufficient to read Hartz's descriptions from Scoresby Sound, and Kruuse's from Angmagsalik, to see that the plant cover is much richer southwards.

The lichen vegetation is seriously influenced by the arid climate of North East Greenland. In the maritime Spitsbergen, and in Novaya Zemlya, the ground is full of brooklets and small and large rivers that drain the glaciers. Many lichens prefer these inundated places, especially *Pyrenocarpous* lichens. I have not yet determined our East Greenland aquatic *Pyrenocarpous* lichens, but the collection is very meagre. One of the few really common species is a *Staurothele* (*fusco-cuprea ?*). Lichens that are characteristic of well drained fissures of vertical rocks, such as *Lecidea rubiformis*, develop mighty cushions on the naked soil, so dry is the soil in North East Greenland.

The most interesting lichen in North East Greenland is perhaps *Acarospora Schleicheri*, in Europe a Mediterranean species. Hartz found it in Scoresby Sound, and Scholander in King Oscar Fjord, a little farther north (1930). It is quite probable that the dry, warm summers make its existence possible. It is, perhaps, a relic from the Post Glacial warmer time.

In North East Greenland some lichen genera are represented by many species and by many common species, such as *Gyrophora, Peltigera, Solorina, Rinodina* etc. Other genera, *e. g. Parmelia, Rhizocarpon*, perhaps also *Lecidea*, concentrate in a few, very common, almost inevitable species. Their other species are few, and much less common than they usually are in the Arctic. Many instances of this have been mentioned in the paper by Scholander and myself.

Few crustaceous lichens were better represented in my Novaya Zemlya collection than the genus *Rhizocarpon*. I obtained 26 species, many of them common. In my North East Greenland collection I have only been able to find 8 species. Out of my several hundred *Rhizocarpon* plants about one-half belonged to one species, *Rhizocarpon disporum* (= *Rh. geminatum*); and *Rhizocarpon geographicum* was about two-thirds of the rest. The same is the case with several other genera.

This feature, that the vegetation concentrates in a few very dominant species, is well known from the heaths of Vascular plants. But I have formerly not been aware that the same would (or could) be the case with the lichens, also, in dry regions.

As far as I know we have no exact investigations on the content of the available plant nutriment in the ground in the Arctic. But on account of the cold, generally frozen soil the roots can only utilize the uppermost strata. And on account of the insignificant supply of decaying organic substance and the violent denudation by the streaming water there is but little fertile humus in the soil.

We can, therefore, understand the concentration of the Arctic vegetation in the bird-cliffs where sea-birds hatch in incredible numbers, and also on prominent rocks and stones where land-birds like to rest. It will be seen from my previous works on Arctic lichens that the lichens are still more dependent on the supply of manure than are the vascular plants. Very many of them are nitrophilous, and a lot of them coprophilous. In the bird-cliffs of Arkhangel Bay, just under 76° N., in Novaya Zemlya, I collected 208 species of lichens in 8 days.

And on Bear Island, where the sea-birds are so abundant, Th. M. Fries collected 185 species in 6 days (1868).

North East Greenland is one of the most inaccessible parts of the earth. In 1929 we had to force our way through a zone of unbroken polar pack-ice, almost 200 km. broad. The following year was a good ice-year, but 1931 was still worse than 1929. It is evident that the sea-birds cannot successfully start breeding on a coast where they are in danger of having ice of that kind just outside of their nests. Foraging will be impossible.

Danish scientists have told me that there is more open water near the outlet of Scoresby Sound. Here we find one bird-cliff on the Liverpool Coast, the northernmost in East Greenland. Farther north there are some land birds, and lichenologists will be glad to find the results of their droppings in the form of a rich lichen vegetation on prominent stones and rocks where they enjoy their siesta. There are also some scattered colonies of terns, who furiously attack every intruder. But the number of birds is equal to nothing as compared with the numbers in a bird-cliff, even if it is quite a small one.

The lack of nutriment from the bird manure and the arid climate are, in my opinion, the great restraining factors of the lichen flora in North East Greenland. We never found the coprophilous *Candelariella crenulata* there. In Spitsbergen and in Novaya Zemlya *Buellia coniops* is so plentiful that it colours the rocks along the beach. I have not yet seen it in my East Greenland collections. There are lots of other nitrophilous (coprophilous) lichens, common in other Arctic regions, but lacking in North East Greenland. Their number is so considerable that it much reduces the total number of lichen species in North East Greenland.

In the accompanying list (TABLE I) I have enumerated all the lichens at present known of some genera from North East Greenland, *i. e.* from Scoresby Sound and northwards. I have omitted some records, which I have been able to check and which I have found incorrect, and also a few which I have not been able to check, but which I have found too improbable (some southern species, even in Norway). In the first column of the enumeration I have recorded the greatest elevation above the sea, in meters, where the lichen in question was found by the Norwegian botanist P. F. Scholander during our expedition in 1930.

In Novaya Zemlya and in Spitsbergen I did not climb much in the

TABLE I. ON THE DISTRIBUTION OF SOME LICHENS OF NORTH EAST GREENLAND

	N. E. Greenland m.s.m.		Scandinavia	Spitsbergen	Nov. Zemlya	Bering Str.
1. Mycocalicium subtile (Ach.) Vain.		+	+			
2. Sphaerophorus globosus (Huds.) Vain.		+	+	+	+	+
3. fragilis Pers.		+	+	+		+
4. Dermatocarpon miniatum (L.) Mann.	900	+	+	+	+	
5. sphaerosporum Lynge	300	+				
6. cinereum (Pers.) Th. Fr.		+	+	+	+	+
7. daedaleum (Kremplh.) Th. Fr.		+	+	+		
8. hepaticum (Ach.) Th. Fr.		+	+	+	+	+
9. Endocarpon pulvinatum Th. Fr.		+	+	+		
10. Arctomia delicatula Th. Fr.		+	+	+	+	+
11. Leptogium pulvinatum (Hoffm.) Cromb.		+	+	+	+	
12. lichenoides (L.) Zahlbr.		+	+		+	
13. saturninum (Dicks.) Nyl.		+	+		+	+
14. Leciophysma finmarkicum Th. Fr.		+	+	+	+	
15. Collema arcticum Lynge		+	+	+	+	
16. pulposum Ach.	700	+	+	+	+	
17. polycarpum (Schaer.) Krempelh.	900	+	+	+	+	
18. rupestre (Sw.) Rabh.		+	+	+	+	
19. Solorina bispora Nyl.	1350	+	+	+	+	
20. saccata (L.) Ach.	3–400	+	+	+	+	+
21. octospora Arn.	900	+	+	+	+	
22. spongiosa (Sm.) Anzi	350	+	+	+	+	+
23. crocea (L.) Ach.	900	+	+	+	+	+
24. Nephroma laevigatum Ach.		+	+			
25. Peltigera variolosa (Mass.) Gyeln.	580	+	+	+	+	+?
26. venosa (L.) Hoffm.	300	+	+	+	+	+
27. Suomensis Gyelnik	200	+	+			
28. rufescens (Weiss) Humb.	1350	+	+	+	+	+
29. polydactyloides Nyl.		+				
30. polydactyla (Neck.) Hoffm.		+	+	+	+	+
31. malacea (Ach.) Fr.	400	+	+	+	+	+
32. erumpens (Tayl.) Vain.	350	+	+	+	+	+
33. leptoderma Nyl.	1200	+	+	+	+	
34. scabrosa Th. Fr.		+	+	+	+	+
35. Cladonia mitis Sandst.		+	+	+	+	+?
36. uncialis (L.) Web.		+	+	+	+	+
37. coccifera (L.) Willd.	1200	+	+	+	+	+
38. squamosa (Scop.) Hoffm.		+	+	+		+
39. cenotea (Ach.) Schaer.		+	+			+
40. cariosa (Ach.) Spreng.	1200	+	+	+	+	+
41. acuminata (Ach.) Lynge	200	+	+	+		+
42. elongata (Jacq.) Hoffm.	580	+	+	+	+	+
43. cornuta (L.) Schaer.		+	+			
44. lepidota Nyl.	300	+	+	+	+	+
45. cervicornis (Ach.) Flot.		+	+		+	
46. fimbriata (L.) Fr.		+	+			+
47. pyxidata (L.) Fr.	1350	+	+	+	+	+
48. cyanipes (Somrft.) Vain.		+	+		+	
49. Stereocaulon alpinum Laur.	1350	+	+	+	+	+
50. rivulorum H. Magn.	1200	+	+	+	+	

TABLE I. ON THE DISTRIBUTION OF SOME LICHENS OF NORTH EAST GREENLAND—(*Continued*)

		N. E. Greenland m.s.m.		Scandinavia	Spitsbergen	Nov. Zemlya	Bering Str.
51.	Stereocaulon fastigiatum Anzi	900	+	+	+	+	
52.	denudatum Flk.		+	+	+	+	+
53.	Gyrophora virginis (Schaer.) Frey	1350	+	+	+	+	
54.	decussata (Vill.) Zahlbr.	1350	+	+	+	+	
55.	polaris Scholander	1350	+		+		
56.	proboscidea (L.) Ach.	1200	+	+	+	+	+
57.	hyperborea (Hoffm.) Ach.	360	+	+	+	+	+
58.	arctica Ach.		+	+	+	+	+
59.	torrefacta (Lightf.) Cromb.	1350	+	+	+	+	+
60.	erosa (Web.) Ach.	1200	+	+	+	+	+
61.	vellea (L.) Ach.		+	+	+	+	
62.	deusta (L.) Ach.		+	+		+	+
63.	cylindrica (L.) Ach.	1600	+	+	+	+	
64.	Parmeliopsis ambigua (Ach.) Nyl.		+	+		+	
65.	Parmelia subobscura Vain.	1600	+			+	+
66.	intestiniformis (Vill.) Ach.	450	+	+	+	+	
67.	pubescens (L.) Vain.		+	+	+	+	+
68.	minuscula Nyl.	1600	+	+	+	+	+
69.	stygia (L.) Ach.		+	+	+	+	
70.	alpicola Th. Fr.		+	+	+	+	+
71.	groenlandica Lynge.		+				
72.	sorediata (Ach.) Th. Fr.		+	+	+	+	+
73.	granulosa Lynge.	1350	+	+	+	+	
74.	infumata Nyl.	1350	+	+	+	+	
75.	saxatilis (L.) Ach.		+	+	+	+	+
76.	omphalodes (L.) Ach.		+	+	+	+	+
77.	sulcata Tayl.		+	+	+	+	+
78.	Cetraria hepatizon (Ach.) Vain.	900	+	+	+	+	+
79.	nivalis (L.) Vain.	1350	+	+	+	+	+
80.	cucullata (Bell.) Ach.	400	+	+	+	+	+
81.	islandica (L.) Ach.	360	+	+	+	+	+
82.	crispa (Ach.) Nyl.	900	+	+	+	+	+
83.	Delisei (Bory) Th. Fr.	900	+	+	+	+	+
84.	Cornicularia aculeata (Schreb.) Ach.	1350	+	+	+	+	+
85.	racemosa Lynge.	360	+	+			
86.	divergens Ach.		+	+	+	+	
87.	Evernia mesomorpha Nyl.	220	+	+			+
88.	Dactylina ramulosa Hook.		+		+	+	+
89.	Alectoria ochroleuca (Ehrh.) Nyl.	400	+	+	+	+	+
90.	nigricans (Ach.) Nyl.	580	+	+	+	+	+
91.	jubata (L.) Ach.	1350	+	+	+	+	
92.	nitidula Th. Fr.		+	+			
93.	Thamnolia vermicularis (Sw.) Ach.	1350	+	+	+	+	+
94.	Usnea sulphurea (König) Th. Fr.	1350	+		+	+	
95.	Xanthoria candelaria (Ach.) Arn.	1350	+	+	+	+	+
96.	Physcia tribacia (Ach.) Hedl.	1350	+	+	+	+	+
97.	tenella Bitter	1350	+	+			
98.	muscigena (Ach.) Nyl.	1600	+	+	+	+	+
99.	constipata Nyl.	650	+	+	+		
100.	sciastra (Ach.) Du Rietz.	900	+	+	+	+	+
101.	caesia (Hoffm.) Nyl.	1350	+	+	+	+	+
102.	intermedia Vain.		+	+	+	+	

mountains. The work in the lowland was overwhelming, and the few ascents which I made did not induce me to do too much of it. The vegetation, including the lichens, rapidly diminished. It is possible, from what I saw in Greenland, that I underestimated the alpine lichen vegetation in the eastern Arctic. At least in one place, at Ullafjell in Bell Sound, Spitsbergen, I found a rich lichen vegetation up to 500 m.s.m. However that may be, I was immediately surprised to find a luxuriant lichen vegetation in North East Greenland up to altitudes where I should not have expected to find much in the other Arctic regions.

Unfortunately I was unable to follow up this observation myself. But the following year my friend, P. F. Scholander, joined the Norwegian East Greenland expedition. He was advised to give as much attention as possible to this problem, which he successfully did. His observations were supplemented by some by other members of the expedition. One short Arctic summer is certainly insufficient to clear up definitely a question of this kind, requiring equally much time and physical exertion. Most probably the altitudinal limit can be raised for many, perhaps for all, the species. But as it is, his results are really remarkable. About one-third of the lichen species which we have definitely determined (a little more than 90 species of these genera; we have no records for the other species) were found up to 1000 m.s.m. or more; 38 species were detected up to 900 m. or more; 23 species higher than 1350 m., and 3 species up to 1600 m.

If we exclude the southern species not found north of Scoresby Sound, I venture the suggestion that in Eirik Raude's Land, between the Liverpool Coast and Sabine Island, more than half the number of the lichen species of these genera ascend to 1000 m.s.m., or even higher. It is well known that lichens have a greater vertical range than Vascular plants. We do not know with certainty the percentage of Norwegian Vascular plants that are found at an altitude of 1000 m. or more in our country. Our botanists suggest something like 25%. In my book, *Studies on the Lichen Flora of Norway*, I have enumerated about 220 lichen species. About 100 of them ascend to this altitude.

We must, however, remember that this comparison is not quite just. Some of the 100 are alpine species that descend only to the forest line. Others are lowland species that ascend so high, recruited from the floras of the beach, the lowlands with their deciduous trees, and from the zone of Conifers. The same is the case with the Nor-

wegian Vascular plants. But in Greenland there is no zonation like this so far north. To make the comparison just, we should have to start from the timber line, in Southern Norway about 900–1000 m. above the sea level. Here the conditions of life are more comparable to those of the Greenland beach region. Unfortunately we do not know which of our Norwegian lichens ascend 1000 m. above the forest line. It is not supposed to be a great number. In Norway only the highest peaks attain that altitude. And we know that the conditions of life are very different on isolated peaks from what they are on great massives, such as we have in Greenland.

We will compare the lichen flora of Eirik Raude's Land, in North East Greenland, with the Norwegian alpine lichen flora. We find that out of these 102 lichens only 7 are lacking in Norway. The determination of the crustaceous lichens in our Greenland collections is not so far advanced that we can include them in this comparison. As far as I can see today it is hardly probable that the identity can be so great if we also include them.

One of the 7 species, *Peltigera polydactyloides*, will most probably be found in Norway, to judge from its general distribution. (I am not quite convinced that it really is a good, true species). Three of the other 6 have been described as new: *Dermatocarpon sphaerosporum*, *Parmelia groenlandica* and *Gyrophora polaris*. The distribution of the first two species is unknown.

Gyrophora polaris Scholander is common in this part of Greenland. I have also identified it in Th. M. Fries's collection from West Greenland, near Disko Island, and in Th. Wulff's collection from the northernmost part of Greenland; furthermore, from a few northern Spitsbergen localities and also from Franz Josef Land (it has generally been united with *Gyrophora proboscidea* in literature). But I have searched for it in vain in the Vega collection from Eastern Siberia, in my own Novaya Zemlya collection, and in the Danish collections from South Greenland and from Iceland. It is not found in the Norwegian mountains. It is a species of very northern and of western distribution in the Arctic. Should it not be found in the high American Rocky Mountains? It would be worth while to look after it there. If not, it is a strictly Arctic plant.

Usnea sulphurea is also a species of northern and western Arctic distribution. Simmons collected it in Ellesmere Land. It is common in the northern parts of Greenland, but there is no plant from South

Greenland in the Copenhagen herbarium. The Norwegian lichenologist, P. F. Scholander, an excellent observer, did not find it in South East Greenland, though he did his best to find it. It is so conspicuous that every botanist would have observed it. It is common in Jan Mayen, known from many places in Iceland (it was first described from Iceland), it is also common and widespread in Spitsbergen and in Franz Josef Land. But it is very rare in Novaya Zemlya, and it has never been collected east of Novaya Zemlya. It has never been collected on the European continent.

It is very interesting that *Usnea sulphurea* is also represented in the Antarctic by a very nearly related species. We have such plants in the Oslo herbarium, collected by Borchgrevink.

We cannot always maintain that all the Antarctic records of "*Usnea sulphurea*" or "*Usnea* (*Neuropogon*) *melaxantha*" refer to the same species, for several other species of the *Neuropogon* section are more common in the Antarctic, and they are not always distinguished from the so-called "*Usnea sulphurea.*" This remarkable distribution will be discussed later in this paper.

Dactylina ramulosa is a circumpolar species of a remarkably northern distribution in the Arctic. It is also found in the American mountains and in the European Alps, but not in Scandinavia.

Parmelia subobscura, the last of the 7 species, is a circumpolar Arctic species. It much resembles an esorediated forma of the well known *Parmelia austerodes*, which is quite common in Scandinavia. I am not quite convinced that it really is a proper species, distinct from *Parmelia austerodes*, for in the Arctic soredia are generally poorly developed, and it would be quite natural to regard *Parmelia subobscura* as an Arctic esorediated forma of *Parmelia austerodes*.

On the whole we find only a few North East Greenland species of these genera that are lacking in Norway. The resemblance is so great that it approaches identity. If we found in all 102 species of certain lichen genera on a Norwegian mountain it would be quite probable that 7 of them would be lacking on the neighbouring mountain.

Professor Warming of Copenhagen maintained that the Denmark Strait between Greenland and Iceland was a line of distinction between a western American flora in Greenland and an eastern European flora, represented by its western outposts in Iceland. Professor Nathorst of Stockholm was of opinion that the line of distinction

should be the inland ice of Greenland. The flora of East Greenland is largely European, with some American immigrants, according to him. My results are strongly in favour of Nathorst's view, as far as the lichens are concerned. We should, however, remember that only a part of our lichen collections have as yet been determined. It is possible that the determination of the crustaceous lichens will modify this opinion. But I have already determined so many of them that an eventual modification seems improbable; anyhow it cannot be great.

It is of much interest to know whether a conformity between the flora of North East Greenland and the flora of Norway can be proved for other plants also. A young Norwegian botanist, Mr. Reidar Jørgensen, has studied the Vascular plants of the highest mountains in Southern Norway, called Jotunheimen. His studies necessitated physical strain equally much as botanical knowledge. In TABLE II we find all the species of Vascular plants which he detected higher than 2000 meters above sea-level in these mountains. The first column records his highest find of the plant in question (in meters) in Jotunheimen, the second the number of finds down to the timber line which is here about 900–1000 meters above sea-level, expressing the frequency of the plant in the Jotunheimen, the third column the presence or absence (—) respectively in North East Greenland (Gr.), in the Svalbard region (Sv.), and in Novaya Zemlya (N. Z.). The data on their Arctic distribution have been supplied by the present author. It is evident from the enumerations that nearly all the plants which are found in the really high Norwegian mountains have a wide distribution in the Arctic.

If we could leave the history of the plants quite out of consideration, it would be a simple and reasonable explanation that we have here a number of plants that are exceptionally well adapted to the severe conditions of life in the Arctic and on the highest mountains in Norway. But, if we will also include their history in our considerations, we shall have to discuss two other possibilities. Did the ice-cover sweep away all plants from the Arctic and from the Scandinavian peninsula, or did it leave some refuges, nunataks or ice-free coasts of varying size where such hardy mountain plants could have persisted?

If preference must be given to the former view it is very hard to explain why just the same selected number of plants should have made the same long migrations. The fundamental question can only be

TABLE II. VASCULAR PLANTS ATTAINING 2000 METERS ABOVE SEA-LEVEL IN JOTUNHEIMEN, NORWAY

	Highest find, meters	Number of finds in Jotunheimen	Greenland	Svalbard	Novaya Zemlya
RANUNCULUS GLACIALIS	2300	264	Gr.	Sv.	N. Z.
POA LAXA	2300	215	—	—	—
FESTUCA VIVIPARA	2300	137	Gr.	Sv.	N. Z.
SAXIFRAGA OPPOSITIFOLIA	2300	42	Gr.	Sv.	N. Z.
DRABA FLADNIZENSIS	2300	25	Gr.	—	N. Z.
SEDUM ROSEUM	2200	154	Gr.	Sv.	N. Z.
SAXIFRAGA GROENLANDICA	2200	68	Gr.	Sv.	N. Z.
TRISETUM SPICATUM	2200	154	Gr.	Sv.	N. Z.
CERASTIUM ALPINUM	2200	132	Gr.	Sv.	N. Z.
ANTENNARIA ALPINA	2200	120	Gr.	—	—
LUZULA SPICATA	2200	103	Gr.	—	—
POLYGONUM VIVIPARUM	2200	127	Gr.	Sv.	N. Z.
SAXIFRAGA CERNUA	2200	41	Gr.	Sv.	N. Z.
LUZULA CONFUSA	2100	185	Gr.	Sv.	N. Z.
SALIX HERBACEA	2100	254	Gr.	Sv.	—
SILENE ACAULIS	2100	141	Gr.	Sv.	N. Z.
OXYRIA DIGYNA	2100	111	Gr.	Sv.	N. Z.
SAXIFRAGA RIVULARIS	2100	32	Gr.	Sv.	N. Z.
POA ALPINA VIVIPARA	2100	10	Gr.	Sv.	N. Z.
SIBBALDIA PROCUMBENS	2100	115	Gr.	Sv.	N. Z.
ERIGERON UNIFLORUS	2100	139	Gr.	Sv.	N. Z.
MINUARTIA BIFLORA	2100	33	Gr.	Sv.	N. Z.
SAXIFRAGA NIVALIS	2100	28	Gr.	Sv.	N. Z.
SAUSSUREA ALPINA	2100	131	—	—	—
POTENTILLA ALPESTRIS	2100	82	—	—	—
RANUNCULUS PYGMAEUS	2100	46	Gr.	Sv.	N. Z.
CAREX RUPESTRIS	2100	17	Gr.	Sv.	N. Z.
TARAXACUM CORNUTUM	2100	6	—	—	—
CARDAMINE BELLIDIFOLIA	2000	87	Gr.	Sv.	N. Z.
DESCHAMPSIA ALPINA	2000	63	Gr.	Sv.	N. Z.
CERASTIUM TRIGYNUM	2000	31	Jan Mayen	—	N. Z.
TARAXACUM CROCEUM	2000	45	—	—	—
GNAPHALIUM SUPINUM	2000	37	South Greenl.	—	—
POA ALPINA	2000	27	Gr.	Sv.	N. Z.
ANTENNARIA DIOICA	2000	18	—	—	—
TARAXACUM COCHLEATUM	2000	7	—	—	—

solved by the geologists. We botanists can only say that out botanical evidence is in favour of the persistance theory. We can understand short migrations, but if the migrations had been really long, over the Oceans and over vast continents, how should we explain the uniformity of the floras of such distant regions?

It can be objected that the comparison is not quite just. We ought to have compared the whole North East Greenland flora with the

entire Norwegian alpine flora, growing higher than the timber line. There is a considerable number of plants in North East Greenland, not found in our mountains, perhaps American immigrants. On the other hand there are many plants in our mountains, which are lacking in North East Greenland. But such entire "floras" of vast regions are so heterogeneous things that statistical comparisons must necessarily be very problematical. There are several degrees of a lie, said the Danish botanist, W. Johannsen, the highest of which is biological statistics! However that may be, the plants from our highest mountains of Norway include just the plants which we must consider adapted to live in ice-free refuges during the different glaciations, and it is a very remarkable fact that these floras are so uniform over large areas.

The difference between the lichen flora of North East Greenland and that of Svalbard (Spitsbergen and the adjacent islands) is considerably greater: 20 of these Greenland lichens are lacking in Svalbard, though it is possible that some of them will be found there. Scholander found *Physcia constipata* in Svalbard in 1931; it had been collected in Greenland, in 1930, also by Scholander, an addition to the Arctic lichen flora. But the lichen flora is now much better explored in Svalbard than in Greenland.

Let us discuss the 20 Greenland lichens which are unknown from Svalbard. Firstly, two of the three new Greenland species are lacking in Svalbard. One of then, *Gyrophora polaris*, is found there.

Five of the 20 are southern species in East Greenland, recorded as far north as Scoresby Sound, but not farther north, in Eirik Raude's Land. It is not unreasonable to regard them as pilgrims that have wandered northwards from the fjords of the present Julianehåb district in Southern Greenland, the old Eystribygd, where the ancient colonists from Iceland and Norway held their position during many centuries, before they succumbed. It is the "Riviera" of Greenland. If so, we should perhaps have to regard them also as relic plants from a warmer postglacial time. Svalbard is not connected with a southern region of a clement climate, from which a southern flora could have been recruited, and the present summer climate in Svalbard is not clement.

There is only one of the 20 species which is fairly common in North East Greenland, *viz. Peltigera Suomensis*, nearly related to *P. rufescens*, if not identical. I have repeatedly found this species in Nor-

way; it has been named *Peltigera spuria* in our literature. In Lapland it has a distinct predilection for the old fire-places of abandoned Lapponian camps. In Greenland I often found it in old Esquimaux residences, but it is not restricted to them. In Spitsbergen it should be looked after at the old Dutch settlements on Amsterdam Island; it would really be a satisfaction to find it there.

As far as I can see all the other 19 species are more or less rare in North East Greenland. Though we paid special attention to the rare species, and collected them extensively, we have more material of almost any one of the common species alone in our Greenland collections than we succeeded in finding of these 19 species combined.

There is, accordingly, a considerable difference in the species lists from the North East Greenland and the Svalbard region. But the common species are the same. And they are much more important for geographical considerations than isolated finds of rare species. If we are to find out the character of the Norwegian flora, we shall have to give more attention to *Pinus silvestris* and to *Picea Abies* (= *P. excelsa*) than to the rarest plants, even if the latter are so numerous that they count for much more in a simple enumeration. If a scientist, who was not a trained lichenologist, collected lichens in North East Greenland and in Svalbard, he would perhaps return with something like 60 species from either region, as such people generally do. If he did not work in the bird-cliffs of Spitsbergen, he would bring home almost the same lichens from either region.

We further find that 20 of these North East Greenland lichens are lacking in Novaya Zemlya. And we find that out of these 20 13 are also lacking in the Svalbard region. The greater part of these species are southern plants. We should not be astonished to find them so far north in East Greenland, on account of its clement summers that must be more favourable to them than the maritime cold and moist summers of the Eastern regions. It is quite natural that such species should be lacking in the Svalbard (Spitsbergen) region, also on account of its great isolation from southern regions; the distance from Spitsbergen to North Cape in Norway is a long one.

Out of the 20 species two only are common in North East Greenland: *Peltigera Suomensis* and *Gyrophora polaris*. We have just discussed the former species. The latter is a species of western and northern distribution, found as far east as Franz Josef Land. All the other 18 are "rari nantes" in North East Greenland. With the

exception of the two species just mentioned all the other common North East Greenland lichens of these genera are also found in Novaya Zemlya—each and every one of them.

We must go far east to find the next region where the lichen flora is so well explored that we can draw comparisons: to the Bering Strait region, 150° west of East Greenland, just on the other side of the polar basin. After an exceptionally favourable voyage the famous "Vega" froze in at Pitlekai, near the Strait, on the 28th of September, 1878. It was imprisoned until July 18th, 1879, when the ice broke up. It was a bitter disappointment to the members of the expedition to lose one year, but a mighty stroke of luck to botany, for their botanist, Dr. E. Almquist, brought home large collections of lichens from the winter quarters.

There are about 60 species in common in his collections from the Bering Strait region and in our East Greenland collections of the genera treated in the present paper. We cannot state the number with absolute certainty without an examination of some critical species in the "Vega" collections. Out of the about 40 North East Greenland species that are lacking in the Bering Strait region, several species are common in East Greenland. We will especially mention the interesting species *Usnea sulphurea* and *Gyrophora polaris*, which have a western Arctic distribution. But there are also other common species amongst them.

On the other hand, the Bering Strait region (we here only consider the Strait itself and the adjacent part of the Siberian coast) contains eastern species that are lacking in East Greenland. The Strait must have been a gateway for plant immigration of the highest importance for, to judge from the lichens of the "Vega" expedition, these regions must be among the richest in the Arctic, botanically speaking. The "Vega" expedition found about 400 different species of lichens, about the same number as the Norwegian Novaya Zemlya expedition brought home.

It is only to be expected that the lichen flora of this remote region should be so different from that of North East Greenland. But in reality the difference is not so great as the figures suggest, for the vegetation is much more similar than are the lists of the flora. Let us first remember that the "Vega" expedition dates 50 years back. Since then science has advanced. Several new species have been described, and it is highly probable that a modern lichenologist

would find some of them on the Arctic coast near the Bering Strait, as we have done in the western Arctic.

Out of the 60 species common to both regions only 10 species are rare in North East Greenland. They are chiefly southern species. This again brings before us the well established fact that North East Greenland is an exceptionally favourable country for southern species, in spite of its high latitude.

We find, accordingly, that about 50 of the common North East Greenland lichens out of these genera are also found near the Bering Strait. That is by far the greater part of the common species in our Greenland region. It is just one-half of the whole North East Greenland flora of these genera. And they more than counterbalance the other half with respect to frequency and importance in the Greenland vegetation. It can safely be said that if a non-lichenologist collected lichens in these regions, he would bring home a (small) collection from either region, consisting of almost the same species. Our result is that a very large percentage of the lichens (of these genera) that are common in North East Greenland have a wide Arctic distribution; the greater part of them are circumpolar.

I will define as circumpolar a lichen that is found in Greenland (inclusive of Ellesmere Land), the Svalbard region, Novaya Zemlya and the Bering Strait region, north of the Strait. As long as the Siberian and the Canadian Arctic coasts are so insufficiently explored, we cannot, unfortunately, include the few scattered records from these immense ranges in our discussions. Out of the well over 100 species, which I have here considered, I now regard almost 50 as circumpolar. Undoubtedly further research will increase the number. And the circumpolar lichens are obviously those that are common in all the regions, or in several of them.

Can we connect their frequency and their great distribution with special manners of dispersal, which we could suppose to be peculiarly effective?

In Arctic lichens we find three possible manners of dispersal, *viz.* by means of spores, soredia and thallus fragments. The soredia are certainly not important. They are found only in a few Arctic lichens, and, if found, they are often poorly developed, corticated and certainly inefficient. But we must confess that the circumpolar sorediated lichens are common where I have seen them, with the exception of the two *Cladoniae*. All the non-circumpolar sorediated lichens are rare.

We can safely say that apothecia are either entirely lacking or very rare in each of the sorediated lichens. If their soredia really are so ineffective as I suppose them to be, they are chiefly propagated by thallus fragments, and they should then be added to the second column in the following enumeration (TABLES III AND IV).

TABLE III. CIRCUMPOLAR LICHENS OF NORTH EAST GREENLAND

Apothecia well developed	Apothecia lacking or very rare	Soredia developed (effective?)
DERMATOCARPON CINEREUM HEPATICUM	SPHAEROPHORUS GLOBOSUS	PELTIGERA ERUMPENS
ARCTOMIA DELICATULA	PELTIGERA RUFESCENS, POLYDACTYLA, MALACEA and SCABROSA	CLADONIA COCCIFERA f. PYXIDATA f.
SOLORINA SACCATA more probably S. BISPORA	CLADONIA MITIS, UNCIALIS, COCCIFERA, CARIOSA, ELONGATA, LEPIDOTA and PYXIDATA	PARMELIA SOREDIATA GRANULOSA SULCATA
SOLORINA SPONGIOSA CROCEA	STEREOCAULON ALPINUM and DENUDATUM	XANTHORIA CANDELARIA
GYROPHORA PROBOSCIDEA HYPERBOREA ARCTICA TORREFACTA EROSA	PARMELIA PUBESCENS, MINUSCULA, ALPICOLA, SOREDIATA, GRANULOSA, SAXATILIS and OMPHALODES	PHYSCIA TRIBACIA CAESIA
PARMELIA PUBESCENS ALPICOLA SAXATILIS	CETRARIA HEPATIZON, NIVALIS, CUCULLATA, CRISPA, ISLANDICA and DELISEI	
CETRARIA HEPATIZON	CORNICULARIA ACULEATA	
	ALECTORIA OCHROLEUCA and NIGRICANS	
	THAMNOLIA VERMICULARIS	
	PHYSCIA MUSCIGENA and SCIASTRA	

In these columns we find almost the same proportion for the widespread circumpolar Arctic lichens as for the less widespread or local species. We cannot conclude that any one of these manners of multiplication is more effective for migration than another. We must find other causes. The number of species is not so great that a comparison between the percentages would be of interest. And even if it were larger, statistical considerations should be used with great care in biology. They easily conceal causalities.

Let us compare those species, which are always, or nearly always, sterile in the Arctic, with the same species, when growing under more

TABLE IV. NON-CIRCUMPOLAR LICHENS OF NORTH EAST GREENLAND

Apothecia well developed	Apothecia lacking or very rare	Soredia developed (effective?)
Mycocalicium subtile	Sphaerophorus fragilis	Peltigera leptoderma
Dermatocarpon miniatum sphaerosporum daedaleum	Leptogium pulvinatum	Cornicularia racemosa
Leciophysma finmarkicum	Collema pulposum	Evernia mesomorpha
Endocarpon pulvinatum	Peltigera variolosa and polydactyloides	Physcia tenella
Collema arcticum polycarpum	Cladonia squamosa, cenotea, acuminata, cornuta, lepidota, cervicornis, fimbriata, pyxidata and cyanipes	
Peltigera venosa Suomensis	Gyrophora decussata, vellea and deusta	
Stereocaulon rivulorum (often sterile)	Parmelia subobscura, intestiniformis, stygia, groenlandica and infumata	
Stereocaulon fastigiatum (often sterile)	Alectoria jubata	
Gyrophora virginis polaris cylindrica	Usnea sulphurea	
	Physcia constipata and intermedia	

favourable conditions in southern regions. We find that the greater number are sterile under all conditions of life. They are genotypically sterile. But there are also some species, which we could not have placed in that category if we had been examining the lichen flora of a southern country, *e. g. Peltigera polydactyla, P. malacca* and *P. variolosa*, several *Cladoniae*, and *Parmelia stygia.*

We can safely conclude that in some lichens the Arctic conditions of life make the formation of apothecia difficult, if not impossible. If such lichens had no other means of propagation they would be quickly eliminated from the Arctic flora. As it is, they are quite as common and as widespread as most other lichens.

If the different distribution of these lichens cannot be explained by their different manner of dispersal, we might suggest that it could be due to their different rapidity of growth. That is possible. But lack of well established knowledge on that point prevents us from giving much attention to that possibility.

I do not, however, think it an important factor. We know that the rapidity of growth is very different in different lichens. Some *Cladoniae* have a very slow growth. In the Arctic a *Cladonia alpestris*

would certainly require 50 years or more to become full-grown. Related *Cladoniae*, such as *C. rangiferina* and *C. silvatica* (in the Arctic *C. mitis*) have a considerably quicker growth. And that is still more the case with other *Cladoniae*, such as *C. coccifera* and the other red-fruited species.

The non-circumpolar *Peltigerae* cannot be supposed to have a slow growth. The same must be the case with the *Stereocaulons*, which we know to be quick growers. I cannot believe that the 3 non-circumpolar *Gyrophorae* could be slow growers; a species such as *Gyrophora deusta* should, on the contrary, be a quick grower.

Let us not forget the geographical factors. The distances between the continents are not so great in the Arctic as they are farther south. The distance between Norway and East Greenland is only one third of the distance between Norway and New York. The distance between East Greenland and Spitsbergen is much shorter still. The distance from the North East Land of Svalbard and Franz Josef Land is next to nothing, and from the latter archipelago to Novaya Zemlya it is also so short that many plant diaspores (*sensu* Sernander) must have been able to pass. Along the Siberian and the Canadian coasts there is a continuous way overland.

The oversea distances have formerly been still shorter than they are today. During the greatest glaciation much water was frozen up in the enormous glaciers, and the sea-level was lower than today. One of our leading geologists has suggested to me that it could have been about 200 meters lower than it now is. That would have exposed much land, which is now under the sea.

If we could venture a consideration of the Wegener hypothesis the great conformity of the lichen vegetation would be easily explained, on the supposition that the lichens were old enough, geologically speaking. Many facts are in favour of this fascinating hypothesis, others are against it. As long as it is so hypothetical, we should perhaps not use it too much as a platform for constructions.

The same is the case with the supposed land-bridge between Greenland and Europe over Iceland and the Faeroes, which played an important part in the considerations of Nathorst. But can this narrow bridge really explain so general things as the uniformity of distant Arctic floras?

There is but one genus of Crustaceous lichens, the distribution of which is so well known throughout the Arctic that we can use it for

general discussions, *viz.* the genus *Rhizocarpon* (Table V). We are indebted to Dr. E. Almquist, the Vega Expedition, for our material from the Bering Strait, determined by Nylander and Vainio. The data on *Rhizocarpons* from Novaya Zemlya and from Spitsbergen are based on my own determinations; the plants are found in the Oslo Botanical museum. I have also revised the material of this genus from Greenland, found in the leading Scandinavian herbaria.

Unfortunately, I have not seen the material from the Bering Strait region; it is possible that some of Nylander's new species will prove to be identical with other *Rhizocarpons*, recorded from the other regions. Apart from these eastern plants I am responsible for all the determinations. They may be correct or not, but the same name stands for the same species throughout. We have the great advantage that the determinations are fully comparable.

These lists tell a story very different from that of the larger lichens, the Foliaceous and Fruticulose lichens. We find a very small number of circumpolar *Rhizocarpons*, only 6 species out of 48 acknowledged Arctic species. Some species have only been recorded from the Atlantic sector, others have their distribution in the eastern sectors. Out of the 48 species, 4 are (so far) only known from Greenland, 8 are restricted to Novaya Zemlya, and no less than 16 to the Bering Strait region.

There is every reason to believe that a more intense exploration by competent lichenologists will to some extent bridge over such large regional differences. But I am fully convinced that these regions are so well explored, lichenologically, that there must be real, and large, regional differences. First, we find that the genus is much better represented in the eastern than in the western Arctic. The result from the Bering Strait region was obtained by one single expedition which collected 29 *Rhizocarpons*. The same is the case with Novaya Zemlya where the number is 27 *Rhizocarpons*. After about a century of exploration we have only 17 species of *Rhizocarpon* from immense Greenland and only 14 from Spitsbergen.

Greenland is a large continent, rather than an island, covering 23 degrees of latitude, and with more than 1/7 of its area ice-free. Yet its entire known lichen flora is poorer in number of species than is the inconsiderable area along the west coast of Novaya Zemlya, 4 degrees of latitude, and the very small area of Bering Strait with its nearest surroundings westwards. It is not so remarkable that the

TABLE V. ARCTIC RHIZOCARPONS

	Greenland	Svalbard	Nov. Zemlya	Bering Str.
Circumpolar Species.				
1 (1). Rhiz. Copelandii (Kbr.) Th. Fr.	+	+	+	+
2 (2). disporum (Naeg.) Müll. Arg.	+	+	+	+
3 (3). geographicum (L.) DC.	+	+	+	+
4 (4). grande (Flk.) Arn.	+	+	+	+
5 (5). Hochstetteri (Kbr.) Vain.	+	+	+	+
6 (6). polycarpum (Hepp) Th. Fr.	+	+	+	+
Western Arctic Species (Greenland).				
7 (1). Rhiz. crystalligenum Lynge	+			
8 (2). groenlandicum Lynge	+			
9 (3). occidentale Lynge	+			
10 (4). viridiatrum (Flk.) Kbr.	+			
Arcto-Atlantic Species (Greenland-Svalbard-Novaya Zemlya).				
11 (1). Rhiz. badioatrum (Flk.) Th. Fr.	+	+	+	
12 (2). chionophilum Th. Fr.	+	+	+	
13 (3). distinctum Th. Fr.	+		+	
14 (4). jemtlandicum Malme	+	+	+	
15 (5). obscuratum (Ach.) Mass.	+	+	+	
16 (6). Rittokense (Hellb.) Th. Fr.	+	+	+	
17 (7). pseudospeireum (Th. Fr.) Lynge		+	+	
Novaya Zemlya Species.				
18 (1). Rhiz. albidum Lynge			+	
19 (2). alpicola (Hepp) Flagey			+	
20 (3). Anseris Lynge			+	
21 (4). atroflavescens Lynge			+	
22 (5). cinereoflavescens Lynge			+	
23 (6). cinereonigrum Vain.			+	
24 (7). petraeum (Wulf.) Mass.			+	
25 (8). verrucosum Lynge			+	
Eastern Arctic Species (Svalbard-Novaya Zemlya-Bering Strait).				
26 (1). Rhiz. chioneum (Norm.) Th. Fr.		+	+	+
27 (2). expallescens Th. Fr.		+	+	+
Siberian Arctic Species (Novaya Zemlya-Bering Strait).				
28 (1). Rhiz. chionophiloides (Vain.) Lettau			+	+
29 (2). lavatum (Fr.) Arn.			+	+
30 (3). phalerosporum Vain.			+	+
31 (4). roridulum Th. Fr.			+	+
Arcto-Pacific Species (Bering Strait).				
32 (1). Rhiz. albopunctatum (Vain.) A. Zahlbr.				+
33 (2). "atroalbum" Flot. (?)				+
34 (3). atroalbens (Nyl.) A. Zahlbr.				+

TABLE V. ARCTIC RHIZOCARPONS—(*Continued*)

	Greenland	Svalbard	Nov. Zemlya	Bering Str.
ARCTO-PACIFIC SPECIES (Bering Strait).				
35 (4). RHIZ. ATROCAESIUM (Nyl.)[1]				+
36 (5). DECINERASCENS (Nyl.) A. Zahlbr.				+
37 (6). DETINENS (Nyl.) A. Zahlbr.				+
38 (7). "EUPETRAEOIDES (Nyl.)" (?)				+
39 (8). "EXCENTRICUM (Ach.)" (?)				+
40 (9). INFERNULUM (Nyl.)				+
41 (10). LEUCOPSEPHUM (Nyl.) A. Zahlbr.				+
42 (11). MELANEIMUM (Vain.) A. Zahlbr.				+
43 (12). OCHRODELUM (Nyl.) A. Zahlbr.				+
44 (13). POSTUMUM (Nyl.) Th. Fr.				+
45 (14). PRAEBADIUM (Nyl.) A. Zahlbr.				+
46 (15). SEMOTULUM (Nyl.) A. Zahlbr.				+
47 (16). SUBALPICOLUM (Nyl.) A. Zahlbr.				+
AMERICAN ARCTIC SPECIES (Bering Strait-Greenland).				
48 (1). RHIZ. SUPERFICIALE (Schaer.) Malme	+			+

lichen flora of the isolated Svalbard islands, the most important part of which is the island Spitsbergen, should be so poor in number of species; we have here an attenuated Scandinavian alpine flora with an addition of some specially Arctic lichens, and very few peculiar, perhaps endemic, species.

The difference might be due to historical causes. During the great Glacial epochs glaciation was much more intense in the western Arctic than in the East; as far as I know the Bering Strait region was not glaciated at all. Novaya Zemlya was certainly intensely glaciated. We do not know whether there were small ice-free refuges, or not. The botanical evidence is in favour of the former view, but the question can only be solved by the geologists. But however that may be, Novaya Zemlya was in easy connection with unglaciated areas through the Ural mountains and their slopes and the adjacent lowlands.

[1] The four lichens, *Rhizocarpon atrocaesium*, *infernulum*, *eupetroides* and *excentricum*, were referred to the genus *Lecidia* by Nylander who did not admit *Rhizocarpon* as a valid genus. It is much to be desired that these highly critical lichens should be studied in detail by a competent modern lichenologist. The author has not had the opportunity to do it; therefore he is unable to give definite combinations of the names, and he has found himself obliged to use the above preliminary combinations, "*Lecidia parapetraea* **atrocaesia*" or "*Lecidia atrocaesia*" was described by Nylander in Flora, 1885, p. 446; "*Lecidia infernula*" in Flora, 1885, p. 440; "*Lecidia eupetroides*" in Flora, 1875, p. 12; "*Lecidia excentrica*" was mentioned by Nylander in Enum. Lich. Freti Berh., 1888, p. 234.

Biologically Greenland is isolated. Only along its highly Arctic north-west coast is there a narrow strait, separating it from Ellesmereland. But Ellesmereland is certainly no fertile Goshen. Farther south there are broad seas on all sides, separating Greenland from Labrador and Arctic Canada in the west; on the east there is the whole Atlantic Ocean.

If any group of plants should be able to show a persistance from (or through) Glacial epochs, it certainly must be the lichens. In Novaya Zemlya I detected more than 200 different species of lichens, during 5 days of work, and only 70 different species of Vascular plants, on a very narrow strip of land just south of 76° N. between the glaciated land and the sea. And we know about 200 different species of lichens from the Antarctic continent and the nearest islands, in spite of an exceptionally intense glaciation.

If this view is correct, Vascular plants must have an easier migration than lichens, in spite of their heavier diaspores (*diaspore* is a term, introduced by Sernander, for any part of a plant by which it is propagated, a seed, a spore, a thallus-fragment, a soredium, and the like). The idea is not unreasonable. A seed is a wandering pantry, a spore or a thallus-fragment a poor beggar, immediately dependent on the food conditions of its place of germination, certainly no inviting position in the Arctic. I may add that Professor Carl Christensen, the well known Danish expert on ferns, once told me that there are very many tropical ferns with a very limited range of distribution, suggesting difficult migration, in spite of the easy dispersal of their small spores.

We have found that parts of the Arctic flora are very uniform all over this immense area. The reason for this is a problem of such a generality that it demands an explanation of equally general character. *I can only explain this great conformity of the lichen flora in so distant regions on the supposition that many of the species are very old in their present area, or in adjacent areas.*

Backwards our thought will naturally stop at the time of the great ice ages. We do not know the number of years that have rolled on since the days of the last great glaciation. Being a botanist myself and not a geologist I do not venture to write much on this intricate question. But my geological friends have told me that we have approximate ideas. According to the results of De Geer and his followers something like 40,000 years represent a probable time.

We know that during the greatest glaciation immense areas were covered with mighty glaciers, resembling those of the present Antarctic continent. These areas were inaccessible to any vegetation. Since then a new vegetation has followed the retiring ice. In the present Arctic we find a vegetation of hardy plants, not covering the ground and not so great in number as farther south, but yet much more considerable than the average person supposes. Even trained botanists must be surprised to see it.

Is it possible that so many lichens could have attained their present circumpolar distribution during the time that has elapsed since the days of the great glaciation?

Of course these plants are wonderfully adapted to their present conditions of life; just go and see them. Otherwise they would not have been there. But we know the extreme slowness of all vital processes in the Arctic. Growth in general is incredibly slow there. A bud requires years to mature, and the result is a short shoot with a few leaves, or a flower. We must expect the same slow growth for the Arctic lichens, although we are obliged to confess that our exact knowledge on this interesting point is next to nothing.

It is impossible to deny that many Arctic lichens can have migrated and spread extensively since the ice age. But on the other hand it is quite evident, from their present distribution, that many Arctic plants must be old plants on the earth. The circumpolar *Alectoria nigricans* reaches right down to the mountains of New Zealand where Du Rietz found it to be common. The West-Arctic *Usnea sulphurea* is found, almost identically, in Antarctic regions also. The distribution of the two species of *Dactylina* will be discussed at the end of the present paper. Plants such as these must be old. They could not have attained their present distribution in recent times. Remember the wide distances, the great Oceans, which their diaspores must have covered, the mountains and the deserts which they must have crossed.

I may mention that these few species, which were chosen for examples, have rather large diaspores. They have no soredia. Apothecia are either entirely lacking, or they are so rare that it is a great sensation to find them. So they have only thallus-fragments left for their diaspores.

It would have been much easier to discuss the distribution of Arctic lichens if our knowledge of the alpine and nivale lichens had not been so sorely deficient outside of Europe. There is hardly an interesting

spot on the earth not visited by well equipped American expeditions. But what do we know of the lichens of the high Rocky Mountains? Our knowledge has not increased much since the days of Tuckerman. I am convinced that we should find a lot of Arctic lichens there. The best place to start the research work would perhaps be somewhere near the limit of the greatest glaciation. The same is the case with the Ural and the Altai, which must necessarily be quite as important as the Rockies.

The habitats of some lichens in our own Norwegian mountains also suggest a great age. We have a considerable number of lichens that are either confined to places that have most probably been nunataks during the ice age, or that largely prefer such places. I may mention *Gyrophora rigida, G. fuliginosa, G. vellea* and *Acarospora chlorophana.* If this view is correct, we have here an interesting case of the persistence of plants.

If we call these places "probable nunataks" we suppose the relief of the country to have been modelled out during the Ice Age(s), as it is today. One of our leading geologists, Professor Holtedahl, is of opinion that we cannot do so. He calls attention to the intense erosion in the mountains at the present time, and he regards their relief to be largely of recent origin.

If such plants have not been able to migrate much from their former habitat, which they have so long occupied, we should expect to find them concentrated along or near the ancient front-line of the ice.

The available palaeontological records suggest that the mesozoic flora was very uniform. We find much the same fossils from that time in Greenland, Spitsbergen and the northernmost Arctic islands as we find southwards in temperate and warmer regions. The uniformity during the Tertiary Age was, perhaps, not so great, but it was much greater than at the present day, on account of the disturbances caused by the great glaciation. We have no palaeontological records of the Tertiary lichen flora. But there is every reason to suppose that it would have been equally uniform with the flora of Vascular plants over very wide areas.

The advancing ice must either have entirely destroyed the vegetation of the glaciated areas, driving the plants southwards, as it advanced; or there must have been refuges where a certain number of alpine Tertiary plants could have persisted, eventually other plants also that were able to accommodate themselves to the altered conditions

of life. These refuges must either have been nunataks or ice-free coasts of varying size.

If the present Arctic regions were entirely covered with a continuous ice sheet during the great Ice Age, no plants could have lived there. The entire Arctic flora of today must, in that case, have obtained its present distribution during post-glacial time. That would have necessitated long migrations from south to north, and also across the waters to Spitsbergen and to Franz Josef Land and the other isolated islands.

It seems to me that the other possibility is by far the more probable: *that at least many lichens would have persisted along ice-free coasts, and in part also on some nunataks.*

The flora of the nunataks is a very interesting problem. We have some records on the nunatak flora, but they are far from sufficient. There are the famous records from Jensen's nunatak in S. W. Greenland (63° N.), about 70–80 km. from the coast. Deichmann Branth mentions 26 species of lichens from it. In Novaya Zemlya I once climbed a nunatak east of Mashigin fjord, just south of 75° N. At the foot of the mountain, just over the glacier, I did not find a single plant. But higher up, in the upper part of the rock-fall, the vegetation considerably improved. I here found some *Drabae*, *Saxifraga cernua*, and also a considerable vegetation of mosses and lichens. The number of lichens certainly surpassed the number on Jensen's nunatak. But unfortunately a dense fog surprised me, as soon as I had reached this interesting point. I had to retire immediately, and was glad to find my tent. A fog of that kind can last for weeks on an Arctic glacier.

It is, accordingly, a well established fact that several hardy Arctic plants can live on the nunataks. Amongst the lichens I can especially mention the *Gyrophorae*, such as *G. proboscidea*, and a number of crustaceous lichens, such as *Biatorella coracina* and some *Lecideae*.

My friend P. F. Scholander worked in the North East Land of Svalbard in the summer of 1931. He promised to give as much attention as possible to the nunatak question, and we shall be glad to see his results, when published. But this low land is not so favourable for such researches as are the highlands of Spitsbergen proper and Greenland.

From what I have seen it is difficult to attribute much importance to the nunataks as refuges for Arctic plants during a heavy glaciation.

But I am quite overwhelmed with the richness of the flora of the ice-free coasts, which I have seen, even if the coast is very narrow. The necessary condition for a rich flora is that the coast is open during the breeding and hatching season of the birds. But even if there are few birds, we can find a good vegetation if the temperature during the few months of the growing season is sufficiently high, as in East Greenland.

Our meteorologists do not venture any suggestions on the temperature during the Ice Age. Our geologists have much discussed the fundamental question whether ice-free coasts really existed during the Ice Age. As far as I understand, their opinion is more and more in favour of the view that they did exist, at least during the last glaciation. Even if the traces of the ice can be seen down to the very beach in many places, there can have been an ice-free coast strip outside of the present beach, now submerged. Geologists have suggested to me that the land would have been higher—or the sea lower—during the last glaciation than today. If so the lowlands of the old ice-free coast would not be accessible to study today, a very important point.

In Greenland we have now a very severe glaciation, extending over 23 degrees, from 60°–83° N. Twenty-three degrees southwards from the Norwegian North Cape brings us down to Vienna or to Paris, far south of the old front line of the ice during the greatest glaciation. But in Greenland there are today large areas of ice-free land, about 1/7 of the whole island. We are not a little astonished to find that some of the largest of them are found along the north coast of the island, evidently on account of the low precipitation, the dry air, and consequently the great sublimation from snow and ice.

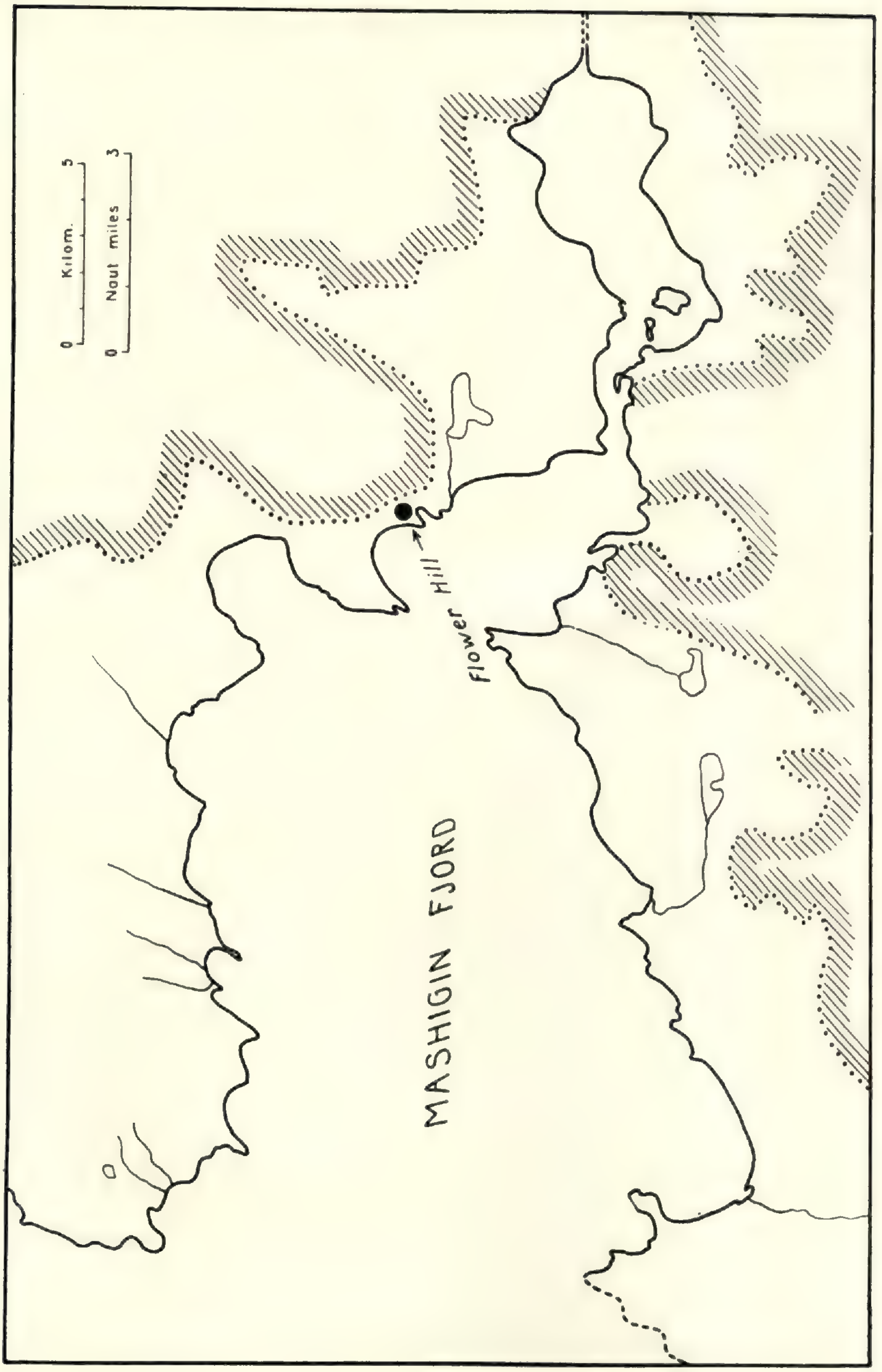
It is highly probable that we had ice-free coasts in Europe during the last glaciation, sufficient for a vegetation that was quite as rich as that of any Arctic region today. We must confess that we are less entitled to reckon upon such ice-free coasts in the present Arctic islands at the same time. But it is hardly probable that these islands would have been entirely covered with ice. A glaciation of continental extent must depend on factors of a wide range. But along the frontiers of a glaciation many local factors considerably influence the front-line of the ice. There are the dry land winds, the foehns, determined by a high atmospheric pressure over the continents. They result in a low precipitation in the lowlands, and a rather high temperature during the summer, locally limiting factors for the glaciation.

Let me devote a few words to the description of the flora of an ice-free coast. I will not describe the flora of North East Greenland, for the ice-free land is there so extensive. But in Northern Novaya Zemlya we have strips of open land, bordering large glaciated areas. I will first describe a "Flower Hill," which we found in Mashigin Fjord, Novaya Zemlya, about 74° 40′ N. The fjord is not long, about 35 km. It is divided into three basins. The innermost of them lies in an intensely glaciated area. It is surrounded by glaciers, which here and there reach the sea. Between the glacier and the sea there is only a narrow strip of moraines with very cold, often irrigated soil, and a very meagre vegetation. But in the middle basin there is a well exposed steep hill on the north side of the fjord, which we called the Flower Hill (Norwegian "*Blomsterbakken*"). We found about 60 species of Vascular plants on this small hill. Its south side was quite covered with the most beautiful flowers seen in the Arctic (Plate 284). There were *Cerastium Regelii*, profusely flowering, *Silene acaulis*, 3 species of *Ranunculus*, a lot of *Drabae*, 9 *Saxifragae*, luxuriant *Dryas*, 3 species of *Potentilla* in full flower, *Astragalus alpinus* and *Hedysarum obscurum*, the beautiful *Polemonium boreale*, *Myosotis alpestris* and *Eritrichium villosum*, with its flowers blue as heaven itself, *Erigeron eriocephalus* and many, many others. This Flower Hill was a revelation of beauty; where are such flowers seen, except in the Arctic?

And surrounding this splendid show of flower beauty on all sides was the glacier. Not an isolated glacier, but the mighty continental glacier itself, stretching across the island to the Kara Sea, and northwards to the very end of Novaya Zemlya. The short distance from the Flower Hill to the glacier will be seen from the sketch map (map 1).

The cause for this remarkable vegetation is evidently first, the position to the sun, resulting in a relatively high temperature during the summer in the soil and in the air near the soil. The well drained ground is also of high importance. This "Flower Hill" was so far from the coast that there were no bird-cliffs. The Arctic sea-birds only hatch in the cliffs close to the open sea.

We saw the influence of the birds on the vegetation in many places, but nowhere more clearly than in a great bird-cliff about 76° N., just south of Arkhangel Bay, in Novaya Zemlya. Though several members of our expedition had travelled much in the Arctic, not one of us had ever seen a bird-cliff of this size (Plate 285). We regard it the greatest on the Arctic coasts. It was 200–300 meters high, and we



Map 1. Flower Hill, Mashigin Fjord, Novaya Zemlya, showing its Proximity to the continental Glacier.

estimated it to be about 15 km. long. The number of hatching birds was far beyond our estimate. Clouds of birds were always on the wing; thousands of birds, and thousands again, were swimming on the sea. A shot against the cliff could not fail to bring down some birds, and it scared myriads of birds to leave it, like a mighty avalanche. The sound of their wings, and of their unmelodious cries, was deafening. The odor of their excrement was penetrating.

The surroundings of this bird-cliff were the most desolate piece of land which I have ever seen in the Arctic, moist, cold clayey soil, almost destitute of plants. On a large peninsula, called Pankratyeff Peninsula, I rambled about one whole day, and only found 14–15 species of Vascular plants, the poorest result of one day's work in my Arctic experience.

But the bird-cliff itself! A continuous cover of vegetation, a soft carpet of mosses, brilliant *Caloplacae* and other lichens on the rocks, and a number of fine flowers everywhere. A lot of *Saxifragae*, of splendid development. I have never seen such plants of *Saxifraga cernua*, not even in Norway. I have never seen such plants of *Cochlearia*, mighty "cabbages" with few flowers. A goat would be highly pleased to see the meadows of *Alopecurus alpinus*, elsewhere growing as scattered individuals. There were lots of other plants, all of them profusely developed, really a "hot-bed" of great beauty. We found nearly 70 different Vascular plants on this bird-cliff. Of course my collections cannot be quite exhaustive, but the full number is not supposed to be much higher.

An enumeration of the Vascular plants from these two localities would not differ much. But the cryptogamic vegetation is very different, on account of the large number of nitrophilous lichens and mosses on the bird-cliffs, and their development to associations that cover the ground. I may refer to my paper on the lichens of Novaya Zemlya. And, like the "Flower Hill" of Mashigin fjord, the bird-cliff was surrounded by large glaciers on all sides. It was only a very narrow strip of ice-free land. Just north of it we saw the glacier-front reaching the sea for miles.

Scholander describes the same rich vegetation on the bird-cliffs of the North East Land, Svalbard, which he visited in 1931. I have also seen it on the bird-cliffs at Mitterhuken, Bell Sound, Spitsbergen. Every botanist, who has travelled in the Arctic, has seen it. It is a general feature in glaciated areas. See, for instance, the frontispiece

of Professor Seward's book, *Plant Life Through the Ages*. The author there shows us a photograph of a glacier of New Zealand, and there are tree ferns in the same photograph, growing less than 1 mile from the terminal face of the ice.

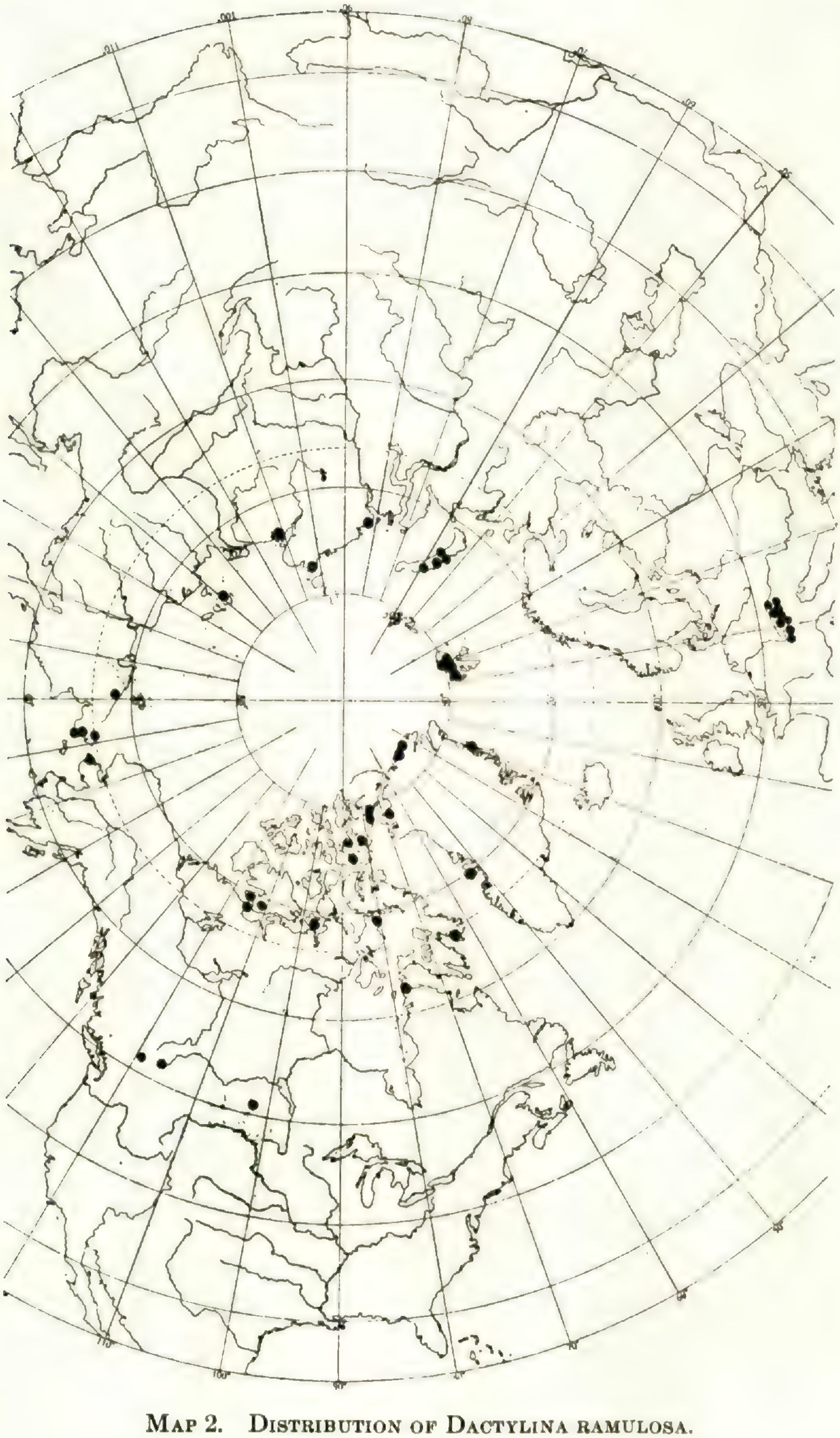
It would be of much interest to know whether there are any plants, the distribution of which is best explained if we could regard them as relic plants, living now along the borders of the old ice-sheet. It seems to me that two species of the lichen genus *Dactylina* are such plants, *viz. Dactylina ramulosa* and *D. madreporiformis*.

In Svalbard *Dactylina ramulosa* (MAP 2) is common along the north coast of Spitsbergen proper and of the North East Land. It is entirely lacking along the west coast, as well as in all the southern part of Spitsbergen. Much the same is the case in Greenland. It has repeatedly been found along the north coast, and in addition to that we have finds from Disko on the west coast (about 70° N.), and another find from Danmark Harbour on the east coast (about 76° 25′ N.), but none from South Greenland.

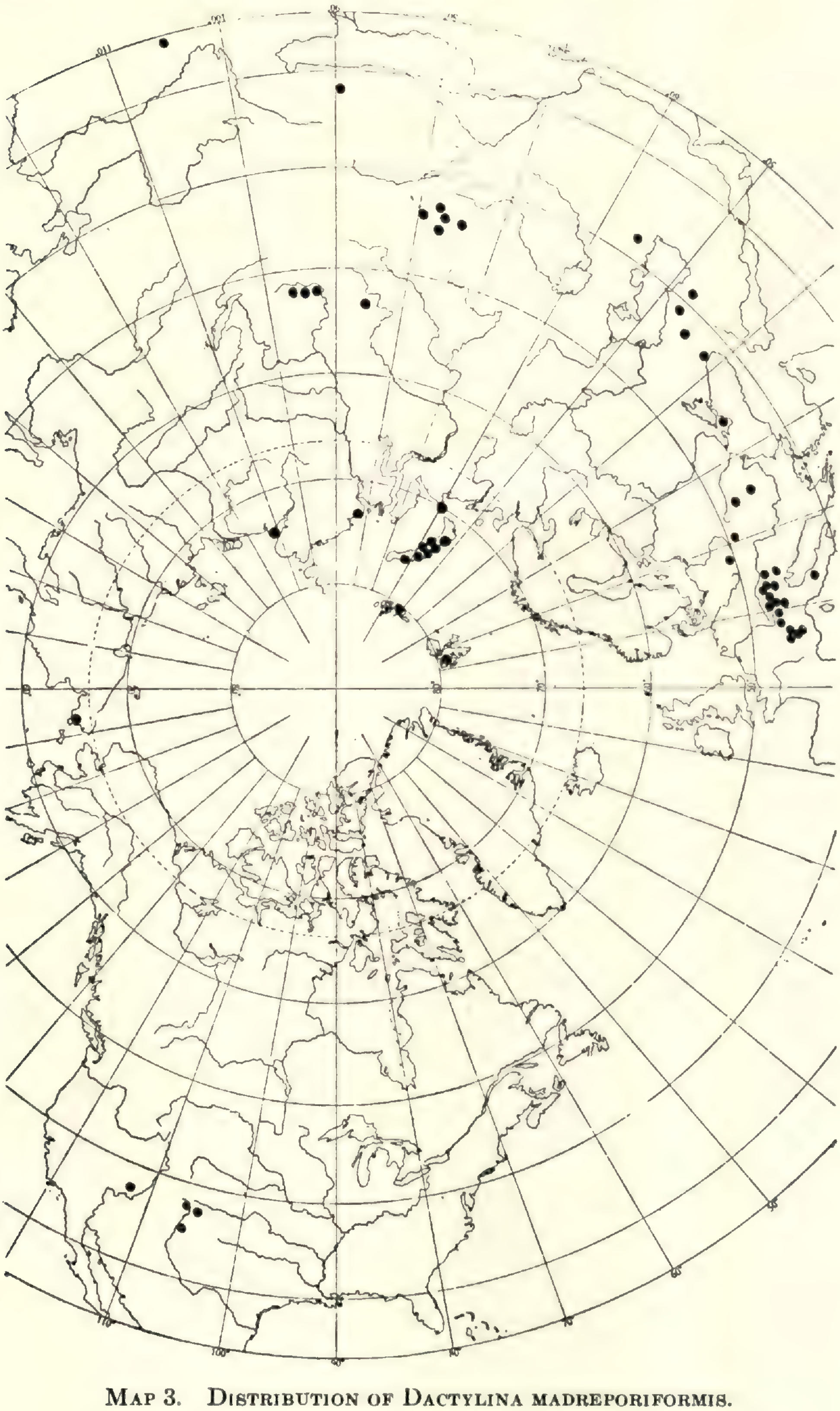
Evidently on account of the low precipitation there are large ice-free coasts in North Greenland, and much the same is the case in North Svalbard, though on a smaller scale. During the Glacial Epoch the climate must have been still more continental than at the present day, on account of the large frozen seas. It is quite possible that we have had ice-free areas, perhaps small ones, even during heavy glaciations, along the northernmost Arctic coasts. If so, we shall have to look after possible old relic plants just along the northernmost Arctic coasts, where there must have been the smallest amount of open water, also, during the Glacial Epochs.

Dactylina ramulosa is a circumpolar species, not common in Novaya Zemlya, scattered along the Siberian coast. It is much more common on the coasts of the Canadian Arctic, on the islands as well as the continent. It is entirely lacking in Fenno-Scandia, and we have no finds from Russia, and none from Siberia south of the coast. But we have several localities from the highest peaks in the Alps between Western Switzerland and Kärnthen-Steiermark. In the Rocky Mountains there are a few finds just north of the 50° parallel N. We do not know whether they are connected with the Arctic localities, for the flora of these regions is almost unknown to the lichenologists.

The other species, *Dactylina madreporiformis* (MAP 3), cannot be called circumpolar. There is only one locality, Wijde Bay, in North



Map 2. Distribution of Dactylina ramulosa.



Map 3. Distribution of Dactylina madreporiformis.

Spitsbergen, but is is common along the west coast of Novaya Zemlya; we have also a few finds along the Siberian coast. It is entirely lacking in Arctic America, apart from a few (not located) finds in Alaska. But we have a considerable number of localities far south in the Rockies, in Colodaro, Utah and New Mexico. In the Old World it is entirely lacking in Fenno-Scandia, but is has a continuous distribution along the highest mountains from the Alps in the west over Tatra, the eastern Carpathians, the Crimea, Caucasus, Turkestan to the Sajan Mountains in the east.

Professor Helmuth Gams, the well known expert on the post-glacial history of the European vegetation, has written to me: "most of the *Dactylina* localities in the Alps are typically nunataks." Full particulars on the distribution of these two species, and a discussion of it, will be found in a paper, recently published by the present writer: "*On Dufourea and Dactylina, three Arctic Lichens,*" Skrifter om Svalbard og Ishavet, No. 59, Oslo 1933.

If we are justified in regarding these two species as old relic plants, perhaps even of Tertiary Age, as the present author does, their history may be thus reconstructed: Very high alpine plants during the Tertiary age with its clement climate, driven to the lowland and southwards by the increasing cold and the advancing ice. Perhaps persisting along ice-free refuges along the northernmost Arctic coast down to the present day. Exterminated in Fenno-Scandia by the ice, if we can suppose that they were found here, but persisting along the mountains south of the ice-frontier. During the alternating Glacial and Interglacial Epochs there must have been considerable oscillations in the distributions of such plants, as has been pointed out *i. a.* by the English palaeontologists, Mr. and Mrs. Reid, in their well known paper: "*The Pliocene Floras of the Dutch-Prussian Border,*" in Mededeel. van de Rijksopsporing van Delfstoffen, No. 6, The Hague 1915.

At present we are living in an Epoch corresponding to an Interglacial period, during which plants, such as the two *Dactylinas*, have to climb the highest mountains in order to find suitable localities. It is, therefore, only to be expected that they should be restricted to the highest Alps in Central Europe, down to about 1800 meters above sea-level.

But why are they lacking in the Scandinavian mountains where excellent localities are so abundant? It is hard to explain. We do

not know whether they have ever been there. But let us suppose that they have. It is possible that the greatest glaciation was so complete that it destroyed all vegetation, and that the two *Dactylinas* have not been able to immigrate since that time. As far as I understand, geologists are of opinion that at the beginning of the Interglacial Epochs temperature must have risen considerably, and during relatively brief periods (geologically speaking) have attained heights which made successful attacks on the mighty ice-cap possible.

It is not every species of plants which is able to migrate so easily that it can profit from the possibilities offered by rapidly retiring ice. On the contrary, we find that a great number of the plants which we know to be relic, for the reason that we know their geological history as well as their present distribution, have a very reduced power of distribution. Numerous such cases are so well known that it is unnecessary for us to give particulars in this brief summary. It is sufficient to refer to Professor M. L. Fernald's papers on the persistence of plants. The present distribution of *Dactylina ramulosa* in the Svalbard region suggests a species with a very reduced power of migration. Its distribution in the Alps and also the widely scattered areas of *Dufourea madreporiformis* likewise suggest a reduction of capacity to migrate.

It will be seen that the study of Arctic botany brings before us problems of a very general character. One of them, the eventual persistence of plants, Arctic as well as others, can with great advantage be attacked by a careful study of the vegetation along the border line of the old glaciations. In America we have the classical studies by Professor Fernald on the persistence of Vascular plants. It is much to be desired that his work should be followed by investigations on the lichen vegetation of the high Rocky Mountains on either side of the old "ice-line." No other group of plants can throw more light on this great problem than the lichens which can grow in profusion close to the mightiest glaciers.

EXPLANATION OF PLATES

PLATE 284. Dense Vegetation of "Flower Hill," Mashigin Bay, Novaya Zemlya (see location on MAP 1): MYOSOTIS ALPESTRIS, ERIGERON ERIOCEPHALUS, TARAXACUM SP., ASTRAGALUS ALPINUS, POLYGONUM VIVIPARUM, etc. *Photo. B. Lynge*, August 4, 1921.

PLATE 285. Part of the bird cliff south of Arkhangel Bay, Novaya Zemlya, with myriads of URIA LOMVIA and other birds. *Photo. B. Lynge*, August 12, 1921.

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CRITICAL NOTES ON PLANTS OF ARCTIC AMERICA[1]

M. O. Malte

[The late Dr. Malte (1880–1933), Chief Botanist of the National Museum of Canada, and the late Professor C. H. Ostenfeld (1873–1931) of the University of Copenhagen left partially completed a monumental Flora of Arctic Canada. Much of the matter, consisting of summaries of records and statements of local occurrence of the species, can await later publication; much was in the form of memoranda and uncompleted revisions. A portion of the manuscript, from the *Rosaceae* through the *Compositae*, by Dr. Malte, consisting of critical notes on northern species should have immediate publication. This matter, with only very slight editorial modification, is here printed.—Eds.]

Potentilla nivea L., var. pallidior Sw. Quebec: Wakeham Bay (1927, 1928). Keewatin: Chesterfield Inlet (1928).

The specimens from Chesterfield Inlet are, as a rule, much more luxuriant than those from Wakeham Bay and have the terminal leaflets often conspicuously long-stalked, thus giving them a different appearance. The peculiar habit of the Chesterfield Inlet plants is no doubt due to the conditions under which they were growing—gravelly patches among rocks frequented by dogs. The unusual length of the stalk of the terminal leaflet is taxonomically of no importance. Analogous long-stalked terminal leaflets are found in otherwise typical *nivea* from Fort Chimo, Ungava Bay, Hudson Strait determined as var. *macrophylla* Lehman by Rydberg.

P. Pedersenii (Rydb,) Rydb., N. Am. Fl. **22**, 33, 1908. *P. subquinata* var. *Pedersenii* Rydb., Bull. Torr. Bot. Club., **28**, 182, 1901. *P. Vahliana* Macoun & Holm, Rpt. Can. Arct. Exp. **5**, Pt. *A*. 16, 1921, non Lehm. Mon. Potent., 172, 1820. *P. rubricaulis* Lehm. var. *arctica* Simmons, Rep. 2nd Norw. Arct. Exp. Fram 1898–1902, No. 2, 51, (1906).

When Rydberg described *P. subquinata* var. *Pedersenii*, he had evidently no clear conception of what his new variety was, for he cited heterogenous material under it, as pointed out by Wolf (Mon. Potent., 239) and Ostenfeld (Medd. Groenl. 64 (1923) p. 186), and corroborated by the writer who, through the courtesy of Dr. M. P. Porsild, has had an opportunity to examine the specimens cited by Rydberg. Most of these specimens belong to *P. nivea* but, fortunately, the specimen designated as the type, No. 470, Assuk, Disco, leg. *Morten Pedersen*, July 25, 1898, is quite distinct from the latter. Its most outstanding characteristic is that the lower surface of the leaves

[1] Published with the permission of the Director, National Museum of Canada, Department of Mines, Ottawa.

is both tomentose and silky long-strigose, the strigose pubescence often being so dense that it hides the tomentum completely or nearly so. In this respect *P. Pedersenii* closely resembles *P. Vahliana* Lehm. and, indeed, Wolf (l. c.) avers that the type of *P. Pedersenii* cannot be separated from *P. Vahliana.*

Wolf, however, has apparently overlooked one character emphasized by Rydberg, namely the shape of the calyx bracts. These are in *P. Pedersenii* "very narrow, linear or linear lanceolate," whereas in *P. Vahliana,* as is equally strongly emphasized by Lehmann (Rev. p. 170), they are ovate or suborbicular. The difference in the shape of the calyx bracts constitutes, as far as the writer's experience goes, a reliable character for the separation of the two superficially very similar species. It should be mentioned, though, that in *P. Pedersenii* the calyx bracts should be described as narrowly elliptical rather than linear or linear-lanceolate.

No doubt many of the records of *P. Vahliana* from the Canadian Arctic belong with *P. Pedersenii.*

Ellesmere Island: Bache Peninsula (1927). North Devon Island: Dundas Harbour (1927). Baffin Island: Arctic Bay, Admiralty Inlet (1927). Southampton Island: Coral Harbour (1928).

P. Crantzii (Cr.) Beck. *P. maculata* Pourr., Macoun, Cat. Can. Pl. I, 140; Rydberg, Mon. Pot., 58 and in N. Am. Fl., **22**, 325; Britton & Brown, Ill. Fl., **2**, 254; Simmons, Phytog. 108. *P. opaca* La Peyr., Pursh, Fl. Am. Sept., 355; Lehm. in Hook. Fl. Bor.-Am. **1**, 191; Torr. & Gray, Fl. N. Am. **1**, 440. *P. alpestris* Hall. fil., Wolf. Mon. Pot.; Porsild, Med Groenl., **47**, 266.

This species was found at Port Burwell (1928) in two main forms which, however, were grading into each other, probably due to intercrossing. The one extreme has slender, ascending stems. The leaves are glabrous on the upper surface, pilose on the nerves below, and the petioles are glabrous. This is

P. Crantzii (Cr.) Beck, var. **vulgaris** (Lge.), n. comb. *P. maculata* Pourr. α. *vulgaris* Lange, Consp. Fl. Groenl., 6, 1880.

The other extreme is more robust with erect stems. The leaves are pilose on both surfaces, and the petioles are more or less densely hirsute. This is

P. Crantzii (Cr.) Beck, var. **hirta** (Lge.), n. comb. *P. maculata* Pourr. β. hirta Lange, Consp. Fl. Groenl. 6, 1880. *P. Langeana* Rydb., Bull. Torr. Bot. Cl., **28**, 199, 1901.

This variety was also encountered at Port Harrison (1928).

P. emarginata Pursh.

Much confusion, as is well known, has prevailed as to what this species really is, what its boundaries are, and what its systematic relationship to other species is. This is perhaps largely due to the fact that monographers and other students of *Potentilla* have had no opportunity to observe in the field the whole group to which *P. emarginata* belongs. As the writer has had such opportunity, a few remarks based on field observations may be in order.

When the writer, in 1927, visited Ellesmere Island, a *Potentilla* of the *emarginata* group was encountered at Craig Harbour. It grew on low gravel bars along a brook where the water table was close to the surface of the ground, forming dense cushions of a decidedly lustrous-grayish appearance. The flowers, which were in anthesis, were borne on stems which in most cases barely overtopped the basal leaves. Specimens identical with the Ellesmere Island ones and at the same stage of development were further collected at Albert Harbour, Eclipse Sound, northern Baffin Island, and at Dundas Harbour, North Devon Island. At these places they were found in small, moist depressions.

At Dundas Harbour a similar *Potentilla* was found on small, dry gravel flats. It was past anthesis and the stems were much longer than the basal leaves. Although somewhat different in general appearance from the form growing in moist depressions, no doubt on account of the different habitat, the writer failed to find any essential differences between it and the latter. The two forms, as also later examination has shown, undoubtedly belong to the same species. This dry land form was also encountered at Arctic Bay, Admiralty Inlet, northwest Baffin Island, and at River Clyde, east coast of Baffin Island.

Arriving, the same year, at Lake Harbour, south coast of Baffin Island, another *Potentilla* of the *emarginata* group was met with. It grew in small clumps and occupied rocky knolls and ledges. In appearance it was so strikingly different from the *Potentilla* found farther north that it forcibly gave the impression of being a different species. The leaves were much less pubescent and, as a result, much greener in appearance than in the northern form. They were, furthermore, much firmer and somewhat coriaceous in texture. The leaflets were conspicuously wider and the teeth of the leaves were obtuse, not acute as in the northern form. The most outstanding characteristic, however, was furnished by the calyx bracts which, after anthesis, were much larger and wider than in the northern form, and horizontally spreading.

This form was, in 1928, found to be common in the Hudson Strait area. It was collected at Port Burwell, Wakeham Bay, and Wolstenholme on the south shore of the Strait, at Cape Dorset on the southwest tip of Baffin Island, and at Chesterfield Inlet, northwest coast of Hudson Bay.

From field observations the writer came to the conclusion that, in the eastern Canadian Arctic, there may be two elements in the *P. emarginata* group, one distinctly southern and one northern. Examination of a large number of specimens in the Gray Herbarium, Cambridge, Massachusetts, the herbarium of the New York Botanical Garden, the United States National Herbarium, Washington, D. C., the herbarium of Academy of Sciences, Philadelphia, Pennsylvania, the herbarium of the Field Museum, Chicago, Illinois, and the National Herbarium of Canada, Ottawa, Ontario, has amply confirmed the conclusion. Apart from the characteristics referred to in the preceding, the two elements can, almost without exception, easily be separated on the hairiness of the petioles of the adult basal leaves. In the northern element the petioles are hirsute with stiff, on well preserved specimens horizontally spreading hairs which are four or five times as long as the width of the petioles. In the southern element the pubescence is soft, and the hairs are of unequal length and generally irregularly ascending.

Owing to the marked differences in the vegetative characters and to the different geographical distribution the writer feels convinced that the two elements represent two distinct species. They have by most authors been united under the name of *P. emarginata* Pursh. They were first recognized as different by Abromeit (Bot. Ergebn. 8–9) who treated them as varieties of *P. emarginata*, a treatment followed by Wolf (Mon. 533–35).

The nomenclature of the two species offers some rather perplexing problems. Abromeit (l. c.) maintains that his two varieties of *P. emarginata* are identical with *P. fragiformis* Willd. and—with a question mark—*P. fragiformis* Willd. b. *parviflora* Trautv., respectively. As Simmons (Fl. Ellesm. 57) has pointed out, however, and as has been elucidated by Wolf (l. c.), the East Asiatic and Bering Sea *P. fragiformis* does not occur in eastern North America. It is a plant having large flowers 20–30 mm. broad and a style once and a half to twice as long as the mature carpels, whereas in the two species of the East going under the name of *P. emarginata* the flowers rarely attain

a width of 20 mm. and have the styles much shorter than the mature carpels.

Erroneous is also Rydberg's statement that *P. fragiformis* occurs in Greenland. The specimen cited by him from Cape York, Grinnell's Arctic Exped., which the writer has examined, belongs to the northern species of the *emarginata* group.

Forms of the *emarginata* group have also been identified with *P. nana* Willd., for instance by Hooker (Fl. Bor.-Am., **1**, 194), Lehmann (Revisio, p. 161), Rydberg (p. 80). As Wolf (pp. 511–12) has shown, however, *P. nana* Willd. is merely a dwarfed form of *P. fragiformis* Willd. Like this, it does not occur in eastern North America. The Labrador plant named *P. nana* by the authors referred to belongs to the southern species of the *emarginata* group, as already suspected by Hooker (l. c.). And so do the specimens cited by Rydberg (l. c.) from Hudson Bay, which the writer has seen.

As mentioned in the preceding, Abromeit (l. c.) recognized the two elements of the *emarginata* group as varieties. These were called vars. *typica* and *elatior* respectively. From his descriptions as well as from those given later by Wolf it seems abundantly clear that the var. *typica* is what the writer in the preceding has referred to as the northern species of the *emarginata* group, and that the var. *elatior*, as also indicated by its name, is what has been referred to as the southern species.

Abromeit's contention that the northern species represents the typical *P. emarginata* Pursh can, however, hardly be correct. Pursh's species was based on specimens collected by Kohlmeister in Labrador. Where in Labrador, does not seem to be known. It may have been on the east coast or it may have been in the Ungava Bay region which Kohlmeister visited one summer. As far as is known to the writer, the only *Potentilla* of the *emarginata* group occurring in Labrador, and particularly in the Ungava Bay region, is the southern representative of the group. The plant-geographical evidence, therefore, strongly indicates that the southern element of the *emarginata* group and not the northern represents Pursh's original species. This contention is substantiated by Pursh's own description which contains the passage "stipulis ovatis integerrimis," a characteristic repeated by Hooker who (l. c. footnote) states that he has examined Kohlmeister's plant, *i. e.* the one on which Pursh's description is based. Now, it is a fact that in the southern species the free part of the stipules is ovate,

whereas in the northern species it is lanceolate. The writer, therefore, does not hesitate to identify the southern species with Pursh's original *P. emarginata.*

P. EMARGINATA Pursh, Fl. Am. Sept. 353, 1814; E. Meyer, Pl. Labr., 74; Lehm., Mon. Pot., 174; Lehm. apud Hooker, Fl. Bor. Am. **1**, 194; Fl. Dan., fasc. 39, 4, pro parte, non Pl. 2291; Lehm., Rev. Pot., 161, pro parte; Lange, Consp., Fl. Groenl., 8, pro parte; Macoun, Cat. Can. Pl., Pt. I, 140, pro parte; Macoun & Holm, Can. Arct. Exp. **5**, Pt. A., 16, pro parte; Rydberg, Mon. Pot., 81, pro parte; Rydberg, N. Am. Fl., **22**, 334, pro parte; Simmons, Phytog., 108, pro parte; Britton & Brown, Ill. Fl. **2**, 255, pro parte. *P. nana* Lehm. apud Hooker, Fl. Bor. Am., 194; Lehm., Rev. Pot., 161; Rydberg, Mon. Pot., as to the Labrador plant, non *P. nana* Willd. Herb. ex Schlecht. *P. emarginata* Pursh, var. *elatior* Abromeit, Bot. Ergebn., 8; Wolf, Mon. Pot., 535.—Perennial. Stems softly pubescent below, villous above, from a few cm. to 2 dm. high or more, 1–several-flowered. Petioles of basal leaves becoming conspicuously elongated after flowering, those of the adult leaves pubescent with soft, irregularly spreading but generally ascending hairs of unequal length. Free part of the stipules ovate, obtuse or abruptly acute at the apex. Leaf-blades distinctly coriaceous, ternate, pilose on both sides when young, glabrous or glabrate or occasionally pilose above when adult; the teeth generally very obtuse, evenly pilose along the edges; terminal leaflet broadly obovate, frequently almost as wide as long, from almost sessile to long-stalked. Calyx bracts elliptic, often broadly so, becoming about as long as the calyx lobes and horizontally spreading after anthesis. Flowers 18–20 mm. wide; the petals pale yellow, obcordate, emarginate; styles much shorter than the smooth carpels.—BAFFIN ISLAND: Lake Harbour (1927); Cape Dorset (1928). QUEBEC: Port Burwell; Wakeham Bay; Wolstenholme (1928). KEEWATIN: Chesterfield Inlet (1928).

P. **hyparctica** n. sp. *P. emarginata* Fl. Dan., Pl. 2291, descr. fasc. 39, 4, pro parte; Lehm., Rev. Pot., 161, pro parte; Lange, Consp. Fl. Groenl., 8, pro parte; Macoun, Cat. Can. Pl., Pt. I, 141, pro parte; Rydberg, Mon. Pot., 81, as to specimens cited from Jones Sound and Greenland; Rydberg, N. Am. Fl., **22**, 334, pro parte; Simmons, Fl. Ellesm., 56, as to specimens cited; Simmons, Phytog., 108, pro parte; Macoun and Holm, Can. Arct. Exp., **5**, Pt. A, 16, pro parte. *P. fragiformis* Rydb., Mon. Pot., 78, as to Greenland plant cited, non *P. fragiformis* Willd; *P. emarginata* Pursh, var. *typica* Abromeit, Bot. Ergebn., 8; Wolf., Mon. Pot., 535.—Perennis. Caules inferiori parte molliter pilosi, superiori parte sat dense villosi, raro supra 1 dm. alti, plerumque 1-flori. Petioli foliorum radicalium breves, post anthesim haud elongati; illi foliorum matura aetate pilis rigidis longissimis plerumque horizontalibus instructi. Stipulae lanceolatae, acutae vel longe-attenuatae. Laminae non coriaceae, ternatae, etiam matura

aetate utrinque pilosae, dentibus acutis raro obtusiusculis apice pilis fasciculatis conspicue instructis. Foliola terminalia anguste obovata plerumque circa duplo longiora quam lata. Bractaeae calycis anguste ellipticae, post anthesim laciniis calycis breviores. Flores illis speciei precedentis minores petalis saturate flavis obcordatis emarginatis. Styli carpellis maturis laevibus multo breviores.

Perennial. Stems softly pubescent below, villous above, rarely exceeding 1 dm. in height, mostly 1-flowered. Petioles of basal leaves short, not at all or inconspicuously elongated after flowering, those of the adult leaves pubescent with stiff, very long hairs which generally, and particularly in the basal parts of the petioles, are horizontally spreading. Free part of the stipules lanceolate, acute to long-attenuate. Leaf-blades not coriaceous, ternate, pilose on both sides even when adult; the teeth acute or rarely obtusish, conspicuously tipped with a tuft of hairs; terminal leaflet narrowly obovate, generally about twice as long as wide, stalked. Calyx bracts narrowly elliptic, not conspicuously enlarged after anthesis, shorter than the calyx lobes. Flowers somewhat smaller than in the preceding species; the petals rich yellow, obcordate, emarginate; styles much shorter than the smooth carpels.—Ellesmere Island: Craig Harbour (1927). North Devon Island: Dundas Harbour (1927). Baffin Island: Arctic Bay, Admiralty Inlet; Albert Harbour, Eclipse Sound; River Clyde (1927).[1]

Dryas integrifolia M. Vahl, f. intermedia (Nath.) Hartz.

Porsild (Medd. Groenl., 58, 104–5) has made it abundantly clear that this is merely an ecological form of *D. integrifolia* occurring in well watered and somewhat shaded habitats. Particularly convincing is his figure (p. 104), showing specimens washed down from high land to river delta and anchored there. The old shoots of these specimens are those of typical *D. integrifolia* whereas the new ones, developed under wet conditions, are those of typical f. *intermedia*. The writer made a similar observation on Southampton Island. There the typical f. *intermedia* was found growing at the bottom of a moist depression, with typical *D. integrifolia* occupying the drier sides. Thus there is no ground for the assumption that f. *intermedia* is a hybrid between *D. integrifolia* and *D. octopetala*. This hybrid, which the writer has collected on Mt. Coliseum at Nordegg, Rocky Mountains, Lat. 52° 29′ N., Long. 116° 5′ W., is quite a different plant.

Baffin Island: River Clyde (1927). Southampton Island: Coral Harbour (1928).

[1] Since Dr. Malte designated no type of his *Potentilla hyparctica* I have selected the following: Ellesmere Island: Craig Harbour, 76° 12′ N, 81° 20′ W , August 2, 1927, *Malte*, no. 119,077 (type in Nat. Herb. Canada; paratype and topotype in Gray Herb)—M. L. F.

ASTRAGALUS ALPINUS L. *Phaca astragalina* Hook., Fl. Bor.-Am. **1**, 145.

This species, which occurs on gravelly and sandy soil, varies somewhat in the colour of the foliage, the leaves sometimes being decidedly grayish. The canescence, however, is not sufficiently well marked to warrant the separation of a variety on that account. The hairiness of the pods is also quite variable. While, as a rule, the pods are black-hairy, the hairs are sometimes brownish or even whitish but the variation in colour does not seem to furnish a stable character.

BAFFIN ISLAND: Arctic Bay; Pond Inlet (1927); Lake Harbour (1927, 1928); Cape Dorset (1928). QUEBEC: Port Burwell; Wakeham Bay; Wolstenholme; Smith Island; Port Harrison (1928); SOUTHAMPTON ISLAND: Coral Harbour (1928). KEEWATIN: Chesterfield Inlet (1928).

OXYTROPIS BELLI (Britton) Palibine.

Concerning this plant, Simmons (Phytog. 111) remarks that it is only after long hesitation that he has decided to keep it as a separate species. Fernald (RHODORA, **30**, 150), however, asserts that it is "a remarkably distinct species," and the writer fully agrees with him. When first observed the writer was struck with its peculiar general aspect, reminding strongly of low specimens of *O. splendens*. It was not found in bloom but the grayish colour and the general complexion of the foliage, the latter due to the leaflets being verticillate or subverticillate, were so characteristic that it could easily be spotted at a distance of twenty meters or more.

For the synonymy and history of the name, which latter is rather peculiar, see Fernald, l. c., 150–51.

KEEWATIN: Chesterfield Inlet (1928).

EMPETRUM NIGRUM L.

This species is rather variable in the eastern Canadian Arctic. Generally the branchlets and expanding leaves are glandular, but forms are sometimes found in which the branchlets are more or less white-pubescent and the expanding leaves both glandular and arachnoid-pubescent. An extreme of the latter type was found at Port Harrison. This particular form to a certain extent reminds of *E. atropurpureum* Fernald & Wiegand in the matter of pubescence, but the seeds are dark-coloured as in *E. nigrum*. As the seeds of *E. atropurpureum*, according to information from Professor Fernald in a letter of Feb. 25, 1932, are always white, Prof. Fernald, who has

kindly examined the Port Harrison plant, considers it an unusually pilose extreme of *E. nigrum*.

The Port Harrison specimens, as well as material from Lake Harbour (1927) and Chesterfield Inlet (1928) were fruiting. These three collections are bisexual and are on that account referable to *E. hermaphroditum* Hagerup, a supposed species of its own. The taxonomic importance of the presence of bisexual flowers is, however, very problematical, to say the least. Hagerup himself says: "In specimens with normally bisexual flowers there are at times isolated flowers in which one sex is suppressed; thus we may often find some male flowers at the top of the shoots of *E. hermaphroditum* in the Faeroes," and "Among . . . monoecious individuals—the two sexes may be mixed without any definite order. This I have only observed in West Greenland. . . . And the above-mentioned monoecious specimens from West Greenland seem from vegetative indications most like reduced forms of *E. hermaphroditum*."

Discussing the taxomonic importance of bisexual flowers in *Empetrum* with Prof. Fernald, he writes (Feb. 25, 1932): "As to hermaphrodite flowers—I find many of them in *E. atropurpureum* (a well marked species from Magdalen Islands, Prince Edward Island, and mountains of Maine, New Hampshire and possibly Vermont), though no plants with them predominant. Specimens with the fruit half-grown show very often perfectly clearly dried up stamens coming from beneath the ovary, but the majority of flowers are unisexual. Similarly, I have been over the eastern American material (from Greenland to New England) of *E. nigrum* and get the same result. Occasional specimens from anywhere in the range have some perfect flowers, while the majority are unisexual. I also find plants in which all the flowers seem to be pistillate, and others in which they seem to be staminate."

In view of the above the writer has reached the conclusion that the existence of bisexual flowers is of no taxonomic importance in *Empetrum*, an opinion shared by Prof. Fernald. Incidentally, the same view was held by Neuman who states that *Empetrum* may be referred to either Monoecia, Dioecia or Polygamia.

Discussing the vegetative differences between *E. nigrum* and *E. hermaphroditum*, Hagerup lays stress on the differences in mode of growth, "the long slender red stems of *E. nigrum* along the edge of the tuft being prostrate and root-forming . . . *E. hermaphrodi-*

tum on the other hand has fresh green stems on its youngest yearling shoots,—even the lowest shoots at the edge of the tuft are not creeping or root-forming." It may be that the stems of *E. nigrum* are prostrate and rooting in certain geographical areas (cfr. Blytt, Norges Flora, p. 1094, 1861), but this characteristic is not constant. In Maine, for instance, as Knowlton points out (RHODORA, **4**, 196). "the prostrate habit is not particularly prominent, as most of the branches are suberect." Similarly, the *Empetrum nigrum* of Switzerland and France, countries where the northern *E. hermaphroditum*, judging from the distribution given by Hagerup, is not found, is described as decumbent with ascending branches (Gaudin, Fl. Helv. **6**, 276, 1830; Rouy, Flore de France. **12**, 188, 1910). It should also be pointed out that *E. hermaphroditum* not always has green yearling branchlets, as Hagerup maintains. In the hermaphrodite specimens from Lake Harbour, Chesterfield Inlet, and Port Harrison they are either red or reddish brown.

Concerning the shape of the leaves, also employed by Hagerup to separate *E. hermaphroditum* from *E. nigrum*, the writer has been unable to use it as a distinguishing character, particularly as it varies greatly in the same specimen.

In treating *E. nigrum* and *E. hermaphroditum* as two separate species, Hagerup also attaches much importance to the fact that *E. hermaphroditum* has twice as many chromosomes as *E. nigrum*, the haploid number in the former being 26 and in the latter 13. A glance at Clausen's tables is, however, quite sufficient to demonstrate that variation in chromosome numbers alone cannot possibly be taken as a criterion of a species in a taxonomic sense. The case of *Callitriche stagnalis* Scop. is particularly illuminating. This comprises forms with 5 haploid chromosomes and forms with 10. According to Jørgensen the two forms "are almost identical—the plants with 5 chromosomes have slightly smaller fruits and are of a lighter green colour than the others" and, according to Hagerup, "the two 'species' [citation marks by Hagerup] are morphologically alike, so that they cannot be directly distinguished one from the other."

In other cases, as Bruun (Symbolae Bot. Upsal. **1**, 156–157 and 162–163) has pointed out, different chromosome numbers are found in many species which are composed of different strains or races, morphological as well as geographical.

Considering all the facts, as presented in the above, the writer is of

the opinion that *Empetrum hermaphroditum* cannot be upheld as a taxonomic unit distinct from *E. nigrum.*

Baffin Island: Pangnirtung; Lake Harbour (1927). Quebec: Port Burwell; Wolstenholme; Smith Island; Port Harrison (1928). Southampton Island: Coral Harbour (1928). Keewatin: Chesterfield Inlet (1928).

Pyrola grandiflora Rad.

Some authors maintain that this is only a variety of *P. rotundifolia* L. Thus, Rosenvinge (Medd. Groenl., **15,** 68) asserts that it cannot be kept specifically distinct from *P. rotundifolia,* as it is connected with the main species by intermediates. Simmons (Fl. Ell., 40) holds a similar opinion, saying that "in the southern part of Greenland forms appear that link it together with *P. rotundifolia* var. *arenaria* Koch." The occurrence of the latter variety in Greenland is, however, rather problematical. Thus, Porsild (Medd. Groenl., **58.** 117), commenting upon *P. rotundifolia* L., var. *arenaria* Lange (an = var. *arenaria* Koch?), writes: "Under this name is several times recorded a plant from Southern Greenland, ranging from 60° to about 69°. I doubt the identity of the plants seen in H. H. (Herbar. Hauniense) with this European form, and I should rather consider them to be forms of the preceding (*P. grandiflora* Rad.) grown in thickets." It is rather significant, too, that Ostenfeld (Kgl. Danske Vidensk. Selskab. Biol. Medd. **6,** 3, 1926), dealing exhaustively with the flora of Greenland and its origin, mentions neither *P. rotundifolia* nor its var. *arenaria.*

The writer's observations in the Canadian Arctic Archipelago and on the arctic North American mainland have not brought to light any evidence whatever of the occurrence of transitions between *P. rotundifolia* and *P. grandiflora.* The latter is, indeed, a very well marked and remarkably constant species, easily separated from *P. rotundifolia* on a character not emphasized by Radius in the description of the species but beautifully illustrated in his Tab. III, Fig. 2. In *P. rotundifolia* the calyx-lobes are lanceolate-triangular, acute or acuminate, with reflexed tips, whereas in *P. grandiflora* they are oblong, obtuse, and with straight tips.[1]

[1] Considerable confusion in respect to the exact identity of *P. grandiflora* may be attributable to Warming who (Bot. Tidsskr. **15,** 167) figures it as having triangular-lanceolate, sharply acuminate calyx lobes, a characteristic which, as stated, does not belong to *P. grandiflora.* Similar confusion has also been created by Lange (Consp. Fl. Groenl., 84) who, describing *P. rotundifolia,* β. *arenaria* Koch as being a plant lower in stature than the typical form and having obtuse calyx-lobes, cites Fl. Dan. Tab. 1861, which depicts *P. rotundifolia* of normal stature, with narrowly lanceolate and very acute calyx lobes.

Baffin Island: Pond Inlet; Pangnirtung; Lake Harbour (1927); Cape Dorset (1928). Quebec: Port Burwell; Port Harrison (1928).

Arctostaphylos rubra (Rehder & Wilson) Fern.

This differs from the ordinary black-fruited *A. alpina* in having red drupes. The writer did not see fruiting specimens of either *A. alpina* or *A. rubra* but the vegetative differences pointed out by Fernald (Rhodora, **16**, 25) are quite sufficient to separate the two without difficulty. The most conspicuous vegetative differences are that in *A. alpina* the leaves are conspicuously marcescent; *i. e.* remaining attached to the branches from one year to another after withering, and ciliate with long bristles, particularly towards the base, whereas in *A. rubra* they are distinctly deciduous and without long bristles along the margins. Fernald maintains (l. c.) that *A. rubra* is restricted to calcareous soils but it is questionable if this is always the case. Specimens of the species—sterile plants as well as berries of the previous year—were collected, June 30, 1932, at Long Point, about 60 miles north of Churchill, west coast of Hudson Bay, by William Güssow, assistant to Dr. L. J. Weeks, Geologist, Dominion Department of Mines, Ottawa. Dr. Weeks reports that the formation at Long Point is granite and that, to his knowledge, no outcrops of calcareous rocks are to be found there.

Vaccinium uliginosum L. var. alpinum Big.

Commenting upon the great diversity of *Vaccinium uliginosum* in Kamtchatka and also in Scandinavia, Hultén (Fl. Kamtch. pt. 4, p. 40) admits that the North American and Greenland "var. *alpinum* Big. . . . seems to be a comparatively distinct, small-leaved type. . . ." The writer would go a step farther and, with Fernald (Rhodora, **25**, 24) and Porsild (Medd. Groenl., **58**, 135 sub. nom. *Myrtillus uliginosa* var. *microphylla*) would consider it a well marked microphyllous variety, with the leaves glabrous on both sides. It may be worthy of note that the berries have a red pulp (Lange, Consp. Fl. Groenl. 91) and, according to Porsild (l. c.) "are very juicy and palatable and are much coveted by Europeans in Greenland." In the European *V. uliginosum* the berries have a colourless juice and an insipid, watery flavour; consumed in large quantities they may cause headache and nausea (cfr. Lindman, Bilder Nord. Fl., 102, and Hegi, Ill. Fl. Mittel-Eur. **5**, pt. 3, 1681).

North Devon Island: Dundas Harbour (1927); Baffin Island: Pond Inlet; Lake Harbour (1927). Quebec: Port Burwell; Wolstenholme; Smith Island; Port Harrison (1928). Southampton Island: Coral Harbour (1928). Keewatin: Chesterfield Inlet (1928).

Among synonyms of *V. uliginosum* var. *alpinum* cited by Fernald (l. c.) is *V. uliginosum* β. *pubescens* Lange. This, however, is a macrophyllous variety differing from the ordinary *uliginosum* in having the leaves puberulent below. It is, as indicated by Porsild (Medd. Groenl. **50**, 381), the same as *V. pubescens* Wormskj.

Another synonym of var. *alpinum* cited by Fernald is *V. uliginosum*, subsp. *microphyllum* Lge. This dwarf-leaved plant was described as having the leaves the glabrous or rarely puberulent (Consp. Fl. Groenl., 91). It, therefore, includes two elements, the glabrous-leaved one being identical with var. *alpinum* Big. and the puberulent-leaved one representing an unnamed variety. For the latter the name *Langeanum* is proposed.

According to the writer's views the trend of variation within *V. uligonosum* sensu ampl. in North America and Greenland may be expressed as follows:

1. Macrophyllous
   2. Leaves glabrous on both sides.....var. *typicum*
   2. Leaves puberulent underneath.....var. *pubescens* Lge.
1. Microphyllous
   2. Leaves glabrous on both sides.....var. *alpinum* Big.
   2. Leaves puberulent underneath.....var. *Langeanum*.

V. ULIGINOSUM L. var. **Langeanum**, n. var. *V. uliginosum* L., subsp. *microphyllum* Lge. pro parte.—Folia pagina inferiore minute puberula; ceterum ut *V. uliginosum* L. var. *alpinum* Big.

Dwarf shrub. Leaves up to about 1 cm. long, minutely puberulent underneath.—QUEBEC: Port Harrison, Aug. 18–20, 1928, No. 120,768. TYPE in National Herbarium of Canada.

ARMERIA LABRADORICA Wallr.

Simmons (Fl. Ellesm., 34) maintains that the *Armeria* (sub. nom. *Statice*) of the subsection *Holotrichae* of Boissier in arctic North America belongs to *S. maritima* var. *sibirica*. In his Phytog. Am. Arct. Archip., p. 120, he modifies his assertion by saying that "the usual arctic form . . . is var. *sibirica*." The Canadian Arctic *Armeria*, however, as represented by numerous collections in the National Herbarium of Canada, including twenty of the writer's own, does not belong to *A. sibirica*. The latter, according to the original description in DC. Prodr., p. 678, has obtuse leaves, and the bracts slightly shorter than the fruiting calyx. All the Canadian Arctic *Armeria* material which the writer has seen has the leaves from sharply acute to acutish, and the bracts are as long as or longer than the fruiting calyx. It, as rightly pointed out by Blake (RHODORA, **19**, 1–9) is

A. labradorica Wallr. Concerning this species, Simmons (Fl. Ell., 36) says: "Specimens from Labrador lying in the Nat. Hist. Mus. herbarium (London) had the outer bracts of the involucre rather narrow and pointed, without membranaceous margin, which accords with the description. Their most noteworthy character is not mentioned in the description, viz., that the calyx is so minutely and scarcely perceptibly pubescent as to be nearly glabrous on the ribs as well as between them." The latter part of the statement, however, is certainly not applicable to *A. labradorica* in general. In all the specimens from the Canadian Arctic which have been examined—and they amount to several hundreds—the mature fruiting calyx is densely strigose with long, stiff hairs on the ribs and between them. What the pubescence on the calyx in *A. sibirica* is like, the writer is not prepared to say, on account of sufficient material not being available. Specimens from Waigatch and Nova Zembla, however, in the Kew herbarium, named *A. sibirica*, have the calyx softer, much shorter, and much more sparsely pubescent than has *A. labradorica*.

As Blake has shown (l. c.), *A. labradorica* is quite a variable plant. Two varieties are recognized under *Statice labradorica*, viz.: *genuina*[1] and var. *submutica*. In the former the calyx and lobes are long-cuspidate (the cusps 0.4–0.5 mm. long); in the latter they are acuminute to short-cuspidate (the cusps 0.2 mm. long or less). All the collections made by the writer belong to the var. *submutica*. This occurs in two forms, viz. f. *glabriscapa* and f. *pubiscapa*.

A. LABRADORICA Wallr. var. **submutica** (Blake), n. comb., f. **glabriscapa** (Blake) n. comb. *Statice labradorica* (Wallr.) Hubbard & Blake, var. *submutica* Blake and f. *glabriscapa* Blake, RHODORA, **19**, 7. 1917. BAFFIN ISLAND: Arctic Bay (1927); Cape Dorset (1928). QUEBEC: Port Burwell (1927); Port Harrison (1928). KEEWATIN: Chesterfield Inlet (1928).

A. LABRADORICA Wallr. var. SUBMUTICA (Blake) Malte, f. **pubiscapa** (Blake), n. comb. *Statice labradorica* (Wallr.) Hubbard & Blake, var. *submutica* Blake, f. *pubiscapa* Blake, RHODORA. **19**. 7. 1917. NORTH DEVON ISLAND: Dundas Harbour (1927). BAFFIN ISLAND: Lake Harbour (1927). QUEBEC: Port Burwell; Wakeham Bay; Wolstenholme (1928).

The two forms are listed separately chiefly because Wallroth's original description of *A. labradorica* is of a plant with pubescent scape (*fide* Blake, l. c. p. 4). In the writer's opinion, however, the

[1] ARMERIA LABRADORICA Wallr. var. **genuina** (Blake), n. comb. *Statice labradorica* (Wallr.) Hubbard & Blake, var. *genuina* Blake, RHODORA, **19**, 6, 1917.

presence or absence of pubescence on the scape is a quite insignificant character taxonomically. In some of the collections the pubescence is very conspicuous, but in others the scapes are better described as finely puberulent than as pubescent.

As more material becomes available, it may even be difficult to uphold vars. *genuina* and *submutica* as separate varieties. There is a collection from Mt. Albert, Gaspé Peninsula, Que., by *M. L. Fernald, L. Griscom, K. K. Mackenzie and L. B. Smith*, July 24, 1923 (Gray Herb. No. 25,980; Nat. Mus. Can. No. 113,441) which Blake has referred to var. *submutica* f. *glabriscapa*. This collection is represented in the Ottawa herbarium by two specimens. In one of them some of the fruiting calyces have the lobes cuspidate with true cusps up to 0.4 mm. long, as in var. *genuina*, while others, from the same head, have the calyx-lobes acuminate or very short-cuspidate as in var. *submutica*.

Castilleja pallida (L.) Kunth. Keewatin: Chesterfield Inlet (1928).

Judging from the records in the National Herbarium of Canada, *C. pallida* (L.) Kunth, var. *septentrionalis* (Lindl.) Gray[1] is, in eastern and arctic British North America confined to the Gaspé Peninsula, eastern Quebec, adjacent parts of New Brunswick (and New England), Newfoundland, Labrador, the south shore of Hudson Strait, the east coast of Hudson Bay, and the east and south coasts of James Bay. The *Castilleja* of the *pallida* group which is found from the mouth of the Mackenzie River along the Arctic coast, and along the west coast of Hudson Bay down to Lat. 55° –60° N., is well marked from var. *septentrionalis* and is either the true *pallida* or a variety thereof. The two differ as follows:

Bracts and flowers pale, leaves linear, entire.....*C. pallida.*
Bracts and flowers more or less purplish.
  Leaves lanceolate or broader; plant villose.....*C. unalaschkensis.*
  Leaves linear, upper ones divided; plant slightly villous in the inflorescence only.....*C. elegans.*

[1] Britton & Brown give *C. pallida* var. *septentrionalis* only as a synonym, claiming that the proper name for the plant is *C. acuminata* (Pursh) Spreng. This species, which is based on *Bartsia acuminata* Pursh, was described from Unalaschka in the Aleutian Islands, off the southwest corner of Alaska. Nevertheless, Britton & Brown assert that plants previously referred to this species (*C. acuminata*) from west of Hudson Bay are now regarded as distinct from it. What the western plants in their opinion are is not stated. It is quite difficult to understand how the *Castilleja* from Eastern Canada and the White Mountains to Hudson Bay can be identified with *Bartsia acuminata*. Pursh's description contains the following: *Bartsia* "foliis alternis praelongo-linearibus, floralibus ovatis longissime acuminatis 3-nervibus, omnibus indivisis" (Fl. Am. Sept. 429). That is to say, *B. acuminata* is a plant with entire and very long-acuminate bracts. Britton & Brown's description, as well as figure, of *C. acuminata*, however, is of a plant having the "bracts oblong, oval, or obovate, obtuse, dentate or entire."

C. PALLIDA (L.) Kunth. Stem from almost glabrous to canescent below, lanate under the inflorescence. *Leaves pubescent or puberulent,* the upper more or less lanate, entire, or the upper cleft. Bracts pubescent, generally lanate on the nerves and margins. *Galea densely crisp-pubescent on the back.*[1]

Simmons maintains that specimens collected by Anderson and reported by Armstrong as *C. pallida* (determined by J. D. Hooker) from Banks Island and Victoria Island belong to var. *septentrionalis.* The geographical distribution of var. *septentrionalis* seems, however, to exclude them from that variety.

C. PALLIDA (L.) Kunth var. SEPTENTRIONALIS (Lindl.) Gray. Stem glabrous or nearly so below, short pilose-hispid or slightly lanate above. *Leaves glabrous,* entire. Bracts glabrous, or ciliate on the nerves and margins, rarely finely pubescent all over. *Galea finely puberulent.*

CASTILLEJA **unalaschkensis** (Cham. & Schltd.), nov. comb. *C. pallida* var. *unalaschkensis* Cham. & Schltd. in Linnaea **2,** 1827, 581; Ostenfeld, Kristiania Vid. Selsk. Skr. 1910, 64. Perennial with ascending stems, about 15 cm. puberulent and villose, especially densely above with long white hairs; leaves broadly lanceolate to lanceolate-ovate, densely puberulent, bracts only very little paler than the leaves; calyx and corolla dull-purple, galea about 8 mm. long, lower lip about 5 mm. not nearly as saccate as in *C. pallida.*—YUKON: Herschel Island; (Yukon, Alaskan islands).

CASTILLEJA **elegans,** nov. sp. *C. pallida* Can. Arctic Exp. Pt. A, **5,** 1921, 19 (ex prin. parte), non (L.) H. B. K. Perennis; caulibus e rhizomate pluribus inferne glabris inflorescentiam versus villosis; foliis glabris linearibus; superioribus trilobatis, lobis lateralibus angustissimis, mediano majore; bracteis lanceolatis, plerumque foliorum situ divisis, vel integris, pallide purpureis; corolla ca. 2.5 cm. longa, puberulente pauloque sericea, pallide purpurascente, galea ca. 8 mm. longa, labio inferiore ca. 5 mm. longo, saccato.

Perennial with several stems 15 cm. high from a rootstock, glabrous below and on the leaves, villous toward the inflorescence; leaves linear, the upper divided into two very narrow lateral lobes and a large mid-lobe; bracts lanceolate, usually divided in the same way or entire, lanceolate, light purplish; corolla about 2.5 cm. long, puberulent and somewhat silky, light-purplish; galea about 8 mm. long; lower lip about 5 mm. long, saccate.—NORTHWEST TERRITORIES: South coast of Coronatiom Gulf, Mouth of Tree River (TYPE in Nat. Herb. Canada, No. 98,899).

[1] Generally the bracts are entire or shallowly lobed, as in var. *septentrionalis.* A collection from the mouth of True River, south coast of Coronation Gulf, by *J. R. Cox and J. J. O'Neill,* July 19, 1915, has some of the lower bracts deeply cleft in linear to lanceolate segments which reach a length of 1 cm. or more. It may perhaps represent a new species.

Pedicularis capitata Adams. Ellesmere Island: Bache Peninsula (1927). North Devon Island: Dundas Harbour (1927). Baffin Island: Arctic Bay (1927). Southampton Island: Coral harbour (1928).

Britton & Brown (**3,** 222) state that the colour of the corolla is "described as white," and Simmons (Ell., 26) maintains that it is yellow. In all the flowering specimens seen by the writer the corolla was dull yellow with the top of the galea tinged with rose or purplish.

According to Simmons (l. c. 27) the species "grows chiefly in marshy soil" but may also occur (l. c. 26) in dry places. The writer found it generally occupying small gravelly ridges or dryish slopes, often accompanied by such typical dry land plants as *Elyna Bellardi* (All.) Koch and *Carex nardina* Fr.

P. lanata Cham. & Schlecht. Baffin Island: Arctic Bay; Pond Inlet (1927); Lake Harbour (1928). Quebec: Wakeham Bay (1927, 1928). Southampton Island: Coral Harbour (1928).

According to Simmons (Ell., 31), *P. lanata* is on Ellesmere island found "mostly in rather wet places having a dense vegetation, but it was also found on gravelly bottom, along rivers together with *Carices*." In West Greenland, according to Porsild (Medd. Groenl., **58,** 143), it occurs "in poor and open heath, often in gravelly barrens far away from other plants," and in western arctic America Johansen records it both from swampy depressions (Can. Arct. Exp. **5,** Pt. C, 37) and from dry, sandy, or gravelly soil and ridges (l. c., 41 and 43).

The writer observed it on barren, gravelly flats and on dry slopes and ridges.

P. hirsuta L. Ellesmere Island: Bache Peninsula, Craig Harbour (1927). North Devon Island: Dundas Harbour (1927). Baffin Island: Arctic Bay; Pangnirtung (1927); Cape Dorset (1928). Quebec: Wakeham Bay; Wolstenholme (1928). Keewatin: Chesterfield Inlet (1928).

On Ellesmere Island, Simmons (l. c. 29) observed this species "chiefly in grassy places, rock ledges as well as on evener loamy ground, by the side of brooks, etc., but also in more open gravelly places." On the other hand, Porsild (l. c. 143) asserts that in West Greenland it grows "on heath, gravelly barrens, seldom on open spots in bogs." The writer found it a plant of decidedly moist habitats.

Campanula rotundifolia L. Quebec: Port Burwell (1928); Wakeham Bay (1927, 1928); Port Harrison (1928).

Witasek (Abh. Wien, p. 51) considers the Labrador *Campanula* of the *rotundifolia* complex a subspecies distinct from the typical *C. rotundifolia* and calls it *C. Gieseckiana* Vest ex Roem. & Schult.[1]

The original description of *C. Gieseckiana* Vest ex Roem. & Schul, (**5**, p. 89) reads: "caule unifloro, calyce corolla quadruplo breviore dentibus subulatis tenuissimis, germino obconico." Witasek (p. 50) amplifies and modifies the original description by making the diagnosis of *C. Gieseckiana* read, in part, as follows: "Caules . . . parte inferiore subtiliter sed dense puberuli, striati, 1–3 flori. Folia caulina . . . summa in bracteas setaceas reducta. . . . Receptaculum breviter obconicum, ore lato; corolla sepalis erectis, lanceolato-subulatis duplo longior. . . ."

Claiming subspecific recognition for *C. Gieseckiana,* Witasek lays particular stress on the shape of the ovary, which is described as broadly obconic. According to Simmons (Ark. f. Botanik, p. 19), however, the shape of the ovary, while rather constant in arctic herbarium material, becomes like that of typical *C. rotundifolia* when specimens are cultivated in lower latitudes, as is done at the Botanic Garden of Copenhagen (l. c., 19). Furthermore, in Fl. Dan., tab. 2711, *C. rotundifolia,* var. *arctica,* which Witasek considers belonging to *C. Gieseckiana,* is figured as having the ovary ovoid, rounded at the base, as in typical *C. rotundifolia.*

In the original description of *C. Gieseckiana* the calyx-lobes are said to be one-quarter the length of the corolla, while Witasek described them as half as long. To this modification of Witasek's Simmons takes objection, emphasizing that the short calyx-lobes are particularly characteristic. The length of the calyx-lobes is, however, as Witasek herself points out, a quite unimportant character. The writer collected specimens from two colonies of *Campanula,* agreeing with the description of *C. Gieseckiana,* as given by Witasek, at Wakeham Bay. In one of the colonies the calyx-lobes were about 5 mm. long, in the other about 8 mm. Furthermore, in a colony collected at Port Harrison the length of the calyx-lobes varied from 4 to 7.5 mm.

Witasek describes *C. Gieseckiana* as having the lower part of the stem finely but densely puberulent. In the material collected by the writer the covering of the basal part of the stem is varying, ranging from rather densely puberulent to almost glabrous, and from very

[1] *C. Gieseckiana* is listed by Witasek as if it were a species but it is abundantly clear from her discussions (l. c. p. 51 and Bot. Not., 1907, p. 162) that she considers it a subspecies only.

minutely puberulent to bristly-puberulent. The variation is on a par with that found, for instance, in the *C. rotundifolia* representatives occurring in the Ottawa district. These belong to *C. intercedens* Witasek. In this species (or "subspecies"?), according to Witasek (p. 44), the stem has not the hairiness characteristic of the true *C. rotundifolia.* That is to say, it is not uniformly hairy all around but the hairiness is restricted to the ribs; it is furthermore of a bristly character. In the Ottawa district the lower part of the stem of "*intercedens*" is finely bristly either all around or on the ribs only, or even is quite glabrous. The taxonomic value of the different types of covering of the lower part of the stem has, to the writer's mind, been much overrated by Witasek.

As far as the Labrador, Hudson Strait, and Hudson Bay plant is concerned the writer is of the opinion that it cannot be considered worthy of subspecific rank.

As Witasek (p. 51) points out, it is rather variable. Specimens collected at Port Burwell have the comparatively small and narrow corolla of typical *C. rotundifolia* and cannot, in the writer's opinion, be held taxonomically distinct from it.

Specimens collected at Wakeham Bay and at Port Harrison differ in having noticeably larger and wider corolla and may be referable to *C. rotundifolia,* var. *arctica* Lge. Witasek (p. 51) maintains that in this variety the stems are always one-flowered. This is not correct, as is quite plain both from Lange's Plate 2711 in Flora Danica and description, fasc. 46, p. 6. Plate 2711 figures three specimens, two of which have one-flowered stems; the third has two branches with four flowers each. Similarly, the specimens from Wakeham Bay are one-flowered, whereas in those from Port Harrison the stems vary from one- to three-flowered.

Whether the two types referred to should be regarded as distinct varieties, separated on the size of the corolla, the writer is not prepared to say, sufficient material not being available. Judging from Kruuse's (Medd. Groel. **30**, 257) records and Porsild's (Medd. Groenl. **58**, 147) observations, however, the size of the corolla in the Greenland *C. rotundifolia* seems to be a character too variable to be of much value taxonomically. The same is very probably the case in the Labrador complex.

ERIGERON UNALASCHKENSIS and ERIOCEPHALUS.

As Rydberg (Bull. Torr. Bot. Club, **37**, 1910, 318) has pointed out,

the real *E. uniflorus* L. has not been found on the North American continent. In what has been called *E. uniflorus* he says: "The involucre is more or less turbinate, tapering into the enlarged end of the stem, and black-hairy, while in the typical *E. uniflorus* the involucres are hemispheric, and more or less white-hairy, and the stem is not thickened." The North American so-called *E. uniflorus*, thus described by Rydberg, is *E. pulchellus* DC. β. *unalaschkensis* DC. Rydberg elevated it to specific rank but, in doing so, he overlooked the fact that the plant had already been designated as a species by Vierhapper (Beih. Bot. Centralbl. **21**, 1906, 492). The correct name, therefore, is *E. unalaschkensis* (DC.) Vierh. and not *E. unalaschkensis* (DC.) Rydb., as given in Rydberg's "Flora of the Rocky Mountains and Adjacent Plains."

Concerning *E. eriocephalus* J. Vahl, Vierhapper (l. c., 512) considers it a form of *E. uniflorus*, asserting that it is nothing but the end link in a series of forms starting from the latter, and that the increased density of the pubescence in *E. eriocephalus* simply signified an adaptation to a severe climate. Lindman (Bot. Not., 1910, pp. 161–164, and Sv. Dan. Flora, 1918, 530), on the other hand, having examined authentic specimens of *E. eriocephalus* from Greenland labelled by Vahl himself, which Vierhapper had not (l. c. 513), maintains that *E. uniflorus* and *E. eriocephalus* are two different species. The main differences between the two are as follows:

In *E. uniflorus* the heads are as a rule not over 15 mm. wide, and the involucral bracts are closely appressed and hirsute, the pubescence becoming much sparser toward the tips. In *E. eriocephalus* the heads are about 20 mm. wide or more, except in small and apparently starved specimens, or in specimens existing under unfavourable conditions in general; the bracts are loosely appressed, often squarrose, and densely and conspicuously lanate all over, the heads having a peculiar, touseled appearance. Lindman also emphasizes that in *E. eriocephalus* the stem-leaves are longer than the internodes, whereas in *E. uniflorus* they are shorter, leaving the upper part of the stem bare. This character, however, is, judging from the rather large collections made by the writer, quite unreliable.

Concerning the relationship between *E. eriocephalus* and *E. unalaschkensis*, there can be no doubt that the two are different species. Simmons (Phytog., 126) thinks differently or at least doubts whether that is so, basing his doubt partly on the fact that they often are found

growing together. This is of course no argument. Indeed, to anyone who has had the opportunity of seeing them growing together it is abundantly plain that they are quite distinct. Porsild (Medd. Groenl., **58**, 1920, 149) remarks that where they "are found together, e. g., on the coasts of Waygat, the differences in the colouring in the live state are very conspicuous." An incident substantiating this statement may be related. When collecting at Cape Dorset, Baffin Island, 1928, the writer was ably assisted by a missionary, the Rev. H. A. Turner, a young Englishman who had had no botanical training whatever and who had not been in the Arctic before. Coming to a gentle, gravelly slope along a small rivulet, thousands of plants of *Erigeron* were found growing mixed. Pointing out that there were two kinds, one with dark purple and comparatively small heads and of low stature (*E. unalaschkensis*), and another with white woolly and decidedly larger heads (*E. eriocephalus*) and taller, the Rev. Turner was asked to collect a large number of specimens from the mixed stand and to keep the two kinds separate. This he did without making a single mistake.

E. UNALASCHKENSIS (DC.) Vierh. QUEBEC: Port Burwell (1928); Wakeham Bay (1927, 1928). BAFFIN ISLAND: Lake Harbour (1927); Cape Dorset (1928).

E. ERIOCEPHALUS J. Vahl. QUEBEC: Wakeham Bay (1927). BAFFIN ISLAND: Cape Dorset (1928). NORTHWEST TERRITORIES: Chesterfield Inlet (1928).

MATRICARIA INODORA L., var. NANA (Hook.) Torr. & Gr. Fl. N. Am. **2**, 1843, 412. *Pyrethrum inodorum* β. *nanum* Hook., Fl. Bor.-Am. **1**, 1833, 320 *Chrysanthemum grandiflorum* Hook., Parry's 2nd Voy., 1825, App., 398, non Bouss., 1804. *M. inodora* L. Macoun, Cat. Pt. 2, 1884, 254, pro parte; Simmons, Phytogeogr., 1913, 126. *M. grandiflora* Britton, Mem. Torr. Bot. Cl., 5, 1894, 340; non Poir., 1813. *M. inodora,* var. *grandiflora* Ostf., Skr. Vid-Selsk. Christiania, 1909, No. 8, 25, 1910. *Chamomilla Hookeri* (Schultz-Bip.) Rydb., N. Am. Flora, **34**, Pt. 3, 1916, 231.

This arctic and subarctic plant, which is characterized by being perennial, by its generally decumbent habit, by fleshy leaves, and by its broadly dark-brown- or black-margined involucral bracts, is very different in appearance from the ordinary *M. inodora* and has been regarded a species of its own, *e. g.* by Britton and Rydberg. Britton raised it to specific rank (Mem. Torr. Bot. Cl., **5**, 1894, 459) under the name of *M. grandiflora* (Hook.) Britt. This name, however, is illigitimate, as there already was a *M. grandiflora* Poir. According

to Rydberg (N. Am. Fl. **34**, Pt. 3, 1916, 231), the name of the plant, when considered a species, should be *Hookeri*. Rydberg places it under *Chamomilla* and makes the combination *C. Hookeri* (Schultz-Bip.) Rydb. (l. c.).

Ostenfeld (Skrifter Vid.-Selsk. Christiania 1909 No. 8, p. 25, Christiania, 1910) considers it a variety of *M. inodora* and calls it *M. inodora* L. var. *grandiflora* Hook. Hooker's *Chrysanthemum grandiflorum*, while the oldest specific name, is, however, not the oldest varietal one. This is *Pyrethrum inodorum* var. *nanum* Hook., Fl. Bor.-Am. **1**, 320, 1833. It was transferred to *Matricaria* by Torr. & Gray, Fl. N. Am., **2**, 1843, 412. The correct name for the plant as a variety is, therefore, *M. inodora* L. var. *nana* (Hook.) Torr. & Gray.

While, as already stated, the plant is strikingly different from the common *M. inodora*, the writer, nevertheless, does not feel justified to treat it as a distinct species, the main reason being that similar forms of ordinary *M. inodora* from the shores of southern Sweden have been observed. These forms, variously interpreted as var. *borealis* Hartm., var. *maritima* (L.) and subsp. *maritima* (L.) are perennial and more or less decumbent, with fleshy leaves and dark-brown to almost black involucral bracts. In their extremes they are very similar to the arctic and subarctic plant under consideration, but intermediates between them and ordinary *M. inodora* occur.

QUEBEC: Wakeham Bay (1928). BAFFIN ISLAND: Cape Dorset (1928). SOUTHAMPTON ISLAND: Coral Harbour (1928). NORTHWEST TERRITORIES: Chesterfield Inlet (1928).

ARNICA ALPINA (L.) Olin, Diss. II, 1799.

The name of this plant is by some authors ascribed to Olin & Ladau—sometimes misspelled Laden or Ladan. According to information kindly supplied by Dr. G. Samuelsson, Stockholm, Olin was the author of the Dissertation where the name *alpina*, as a specific one, first appears. Ladau was only "respondent" and, consequently, the correct name is *A. alpina* (L.) Olin, a combination which is correctly used in all modern Scandinavian floras.

A. alpina is quite variable in respect to the pubescence of the leaves. In some forms the leaves are glabrous or nearly so on both surfaces, in others they are prominently pubescent on both surfaces.

QUEBEC: Wakeham Bay (1928); Wolstenholme (1928). BAFFIN ISLAND: Lake Harbour (1927).

The Occurrence of Littorella americana in New York.—In 1879, Pringle collected on the Vermont side of Lake Champlain a rare little aquatic member of the Plantaginaceae, then identified with *Littorella uniflora* (L.) Aschers., more recently described by Fernald[1] as a new species, *Littorella americana* Fernald. The distribution of this species as recorded by Fernald is, Newfoundland, Nova Scotia, Ontario, Maine, Vermont and Minnesota.

On the basis of Pringle's Vermont collection House[2] included *Littorella americana* in the Flora of New York State with the remark, "and hence to be expected in northern New York." Although the original Pringle collection was made 54 years ago, this species does not seem to have been collected in New York State.

On August 24, and again on August 31, 1933, the writer, accompanied by Mr. R. T. Clausen, collected *Littorella americana* along the south end of Long Lake, Hamilton County, New York. This locality is about 50 miles due west of Crown Point, New York, on Lake Champlain. The plants occurred in extensive grass-like areas on a muddy shore exposed by extremely low water and also submerged in shallow water to a depth of one meter, in association with *Subularia aquatica* L., *Gratiola aurea* Muhl., *Eriocaulon septangulare* With. and *Sagittaria graminea* Michx.

The Long Lake material of *Littorella americana* has leaves from 2–9 cm. long and peduncles of the staminate flowers from 1–4 cm. long. The maximum lengths exceed the measurements recorded for this species by Fernald.

Specimens have been deposited in the herbarium of Cornell University and in the Gray Herbarium.—W. C. Muenscher, Cornell University.

Four Forms of Massachusetts Plants.

Xyris caroliniana Walt., forma **phyllolepis**, f. nov., bracteis sepalis petalis carpellisque omnibus foliaceis lanceolatis; seminibus nullis.—Massachusetts: one clump with normal and fertile *X. caroliniana* in a small quagmire in woods south of Sparrow Young's Pond, Chatham, August 20, 1918, *Fernald & Long*, no. 16,505 (type in Gray Herb.).

[1] Fernald, M. L. The North American Littorella. Rhodora **20**: 61–62. 1918.

[2] House, H. D. Annotated list of the Ferns and Flowering Plants of New York State. N. Y. State Mus. Bul. 254. 1924.

Xyris caroliniana, forma *phyllolepis* is presumably a vegetatively reproducing form, quite comparable with the forms in *Juncus pelocarpus* Mey., *Cyperus dentatus* Torr. and other species in which vegetative or leafy shoots replace the flowers.

SALIX TRISTIS Ait., forma **curtifolia**, f. nov., foliis anguste cuneato-obovatis 1.3–3 cm. longis 0.6–1.7 cm. latis, apice rotundatis subtus griseo-tomentosis, supra opacis subgriseis.—MASSACHUSETTS: dry open sand, Sandwich, October 23, 1922, *Fernald* (TYPE in Gray Herb.).

An extraordinary departure, in its short round-tipped cuneate leaves, from ordinary *Salix tristis*, which has linear-oblanceolate elongate and acute or subacute foliage. Another striking departure from conventional *S. tristis* (with foliage opaque and grayish-pubescent above) is

S. TRISTIS Ait., forma **festiva**, f. nov., foliis lineari-oblanceolatis subtus griseo-tomentosis supra laete viridibus glabris lucidis.—MASSACHUSETTS: along cartroads in dry oak and pine barrens, Bourne, August 21, 1919, *Fernald & Long*, no. 18,315 (TYPE in Gray Herb.).

APIOS AMERICANA Med., forma **cleistogama**, f. nov., corollis minutis clavatis e calyce vix exsertis clausis.—MASSACHUSETTS: along old road in woods and thickets bordering salt marsh along Herring River, West Harwich, August 16, 1918, *Fernald & Long*, no. 17,002 (TYPE in Gray Herb.).

Apios americana, f. *cleistogama* formed a considerable tangle, uniform in having greenish, minute unexpanding corollas which scarcely protrude from the calyx. Neighboring colonies had the normal expanded flowers.—M. L. FERNALD, Gray Herbarium.

NOTES ON ROCKY MOUNTAIN PLANTS.—SALIX PSEUDOLAPPONUM v. Seemen, var. **subincurva**, var. nov., ramis tenuioribus; folia angustiora, oblongo-oblanceolata, 11 x 45 mm., ad basin longe attenuata.—COLORADO: Above Lawn Lake, Rocky Mountain National Park, alt. 11,100 ft., August 5, 1931. *L. Kelso* 3503 (TYPE, in my collection). UTAH: Bullion Canyon, in and near the Gorge, July 27, 1905, *Rydberg* and *Carlton* 7250.

Branches more slender; leaves narrower, oblong-lanceolate, 11 x 45 mm., subincurved, long-attenuate at the base; otherwise similar to the typical form of the species.

SALIX BRACHYCARPA Nutt. var. **alticola**, var. nov., planta 12–17 dm. alta, ramis tenuioribus; folia angustiora, anguste oblongo-oblanceolata, 6 x 24 mm., subincurva; ad basin longe attenuata; amentis laxis, oblongis, 2–2.5 cm. longis.—COLORADO: Near Fairplay,

alt. 10,500 ft., August 10, 1932. *L. Kelso* 3459 (TYPE, in my collection).

Plant 12–17 dm. high; branches more slender; leaf narrower, narrowly oblong-oblanceolate, 6 x 24 mm., subincurved, long-attenuate at the base; aments lax, oblong, 2–2.5 cm. long; otherwise similar to the typical form of the species.

SALIX LUTEA Nutt., var. **desolata**, var. nov., ramis gemmis et foliis juvenilibus dense albescenti-villosis.—ARIZONA: Indian Gardens, alt. 3,800 ft., August 25, 1913. *E. A. Goldman* 2237 (TYPE, in U. S. Nat. Herb.).

Young branches, buds, and leaves densely white-villous; otherwise similar to *S. lutea* var. *ligulifolia* Ball.

× SALIX **Solheimii**, hybr. nov. (*S. nivalis* × *S. Dodgeana*), *S. nivali* similis sed ramis tenuioribus; folia adulta sicca per secundum annum vel plures annos persistentia; folia tenuiora, ovata vel elliptica, numquam subrotunda, 6–12 mm. longa; pagina superior non inciso-reticulata, nervi primarii (sed numquam secondarii) satis incisi; subtus numquam albescentia, numquam elevato-reticulata; foliis juvenilibus ad apicem pubescentibus; amenta sessilia, floribus 2–3.

S. Dodgeanae similis sed nervi primarii paginae superioris foliorum plus incisi, 6–12 mm. longa; ovaria pubescentia.—MONTANA: Yellowstone Natl. Park, Electric Peak, alt. 10,000 ft., July 27, 1931. *L. Kelso* 3,313½ (TYPE, in my collection).

Similar to *S. nivalis* but branches thinner; dead leaves persistent for two or more years; leaf thinner, ovate or elliptic, never rounded, 6–12 mm. long; upper surface of the leaf not incised-reticulate, only the primary nerves incised; below never whitish, never reticulated; young leaves pubescent at the apex; ament sessile, 2–3-flowered.

Similar to *S. Dodgeana* but primary nerves more incised on the upper surface of the leaf.

Schneider, in his key to this group, Journ. Arn. Arb. III, 107. 1921, says the leaves of *S. Dodgeana* are not persistent. My specimens show that they are as persistent as in *S. phlebophylla* or *S. cascadensis*.

I am naming this hybrid after Dr. W. G. Solheim, Associate Professor of Botany at the University of Wyoming, who gave much assistance to Mr. Kelso when collecting in that state.—E. H. KELSO, Washington, D. C.

Volume 36, no. 424, including pages 101–132 and plates 281–283, was issued 6 April, 1934.

Bird-Cliff South of Arkhangel Bay, Novaya Zemlya.

JUN 7 1934

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. June, 1934. No. 426.

OEDOGONIUM IN THE VICINITY OF WOODS HOLE, MASSACHUSETTS[1]

CHIN-CHIH JAO

(Plates 286–288)

THE present investigation deals with the genus *Oedogonium* as represented in collections from Woods Hole and its vicinity in Barnstable Country, southeastern Massachusetts, assembled from 1931 to 1933, mostly by Miss Hannah T. Croasdale and the writer, but a few by Professors W. R. Taylor and G. W. Prescott, and Mr. M. W. Bosworth. To date, the writer has noted fifty species, varieties, and forms, of which eleven are new and forty are previously known kinds.

This paper includes detailed descriptions and drawings of the new forms only, but points out some characteristics of the known species which either have not been described completely or exhibit some divergences from the typical forms.

The stations which have yielded fruiting *Oedogonia* to the writer, may be listed as follows:

1. Silver Beach Pond, West Falmouth.
2. Long Pond, East Falmouth.
3. Weeks' Pond (Main Street), Salt Pond, Fresh Pond, and "Chara Pond"[2] (all Shore Road), in and near Falmouth.

[1] Papers from the Department of Botany and Herbarium of the University of Michigan, No. 448 Published with aid to RHODORA from the National Academy of Sciences.

[2] The names in quotation marks pertain to ponds too small or too isolated to have generally known or authentic names. They are either local designations or arbitrary names adopted by workers at the Marine Biological Laboratory. It is expected that a more precise localization and description will accompany a catalog of the fresh-water algae being compiled by Miss H. T. Croasdale.

4. "Harper Pond" (Whitman Road), "Wood Pond" (Ganset Road at Whitman Road), "Endicott Hollow," "Endicott Mire" (Endicott Road), and Iron Pond, in Woods Hole.

5. "Wall Pond," "Stone Wall Pond," "Sheep Pen Pond," "Deer Pond," "Center Pond," and Fawn Pond, on Nonamesset Island, like the following, in the Elizabeth Island chain off Woods Hole.

6. "Dune Pond," on Nashawena Island.

7. "Pasque O," "Pasque K," and "Pasque J," small ponds on Pasque Island.

8. "Sheep Pond," Barmer Pond, "Club House Pond," "Juncus Pond," and "Juncus Pool," on Cuttyhunk Island.

9. A small swamp on Buck Island, between Nonamesset and Naushon Islands.

10. A pond on Naushon Island.

1. OEDOGONIUM ACMANDRIUM Elfving. Wall Pond, Aug. 1, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*).

2. OEDOGONIUM ACROSPORUM De Bary. Juncus Pond, June 28, and Sept. 1, 1932, Harper Pond, June 26, 1931 and July 3, 1933, and Weeks' Pond, Aug. 10, 1931 (*Croasdale*); Wall Pond, July 5, and Aug. 17, 1933 (*Croasdale & Jao*).

This species was also reported from Grew's Pond, Falmouth, July 20, 1895, by C. P. Nott in Collins, Holden and Setchell, Phycotheca Boreali-Americana No. 163.

3. OEDOGONIUM ACROSPORUM De Bary var. BATHMIDOSPORUM (Nordstedt) Hirn. Wall Pond, Aug. 1, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*).

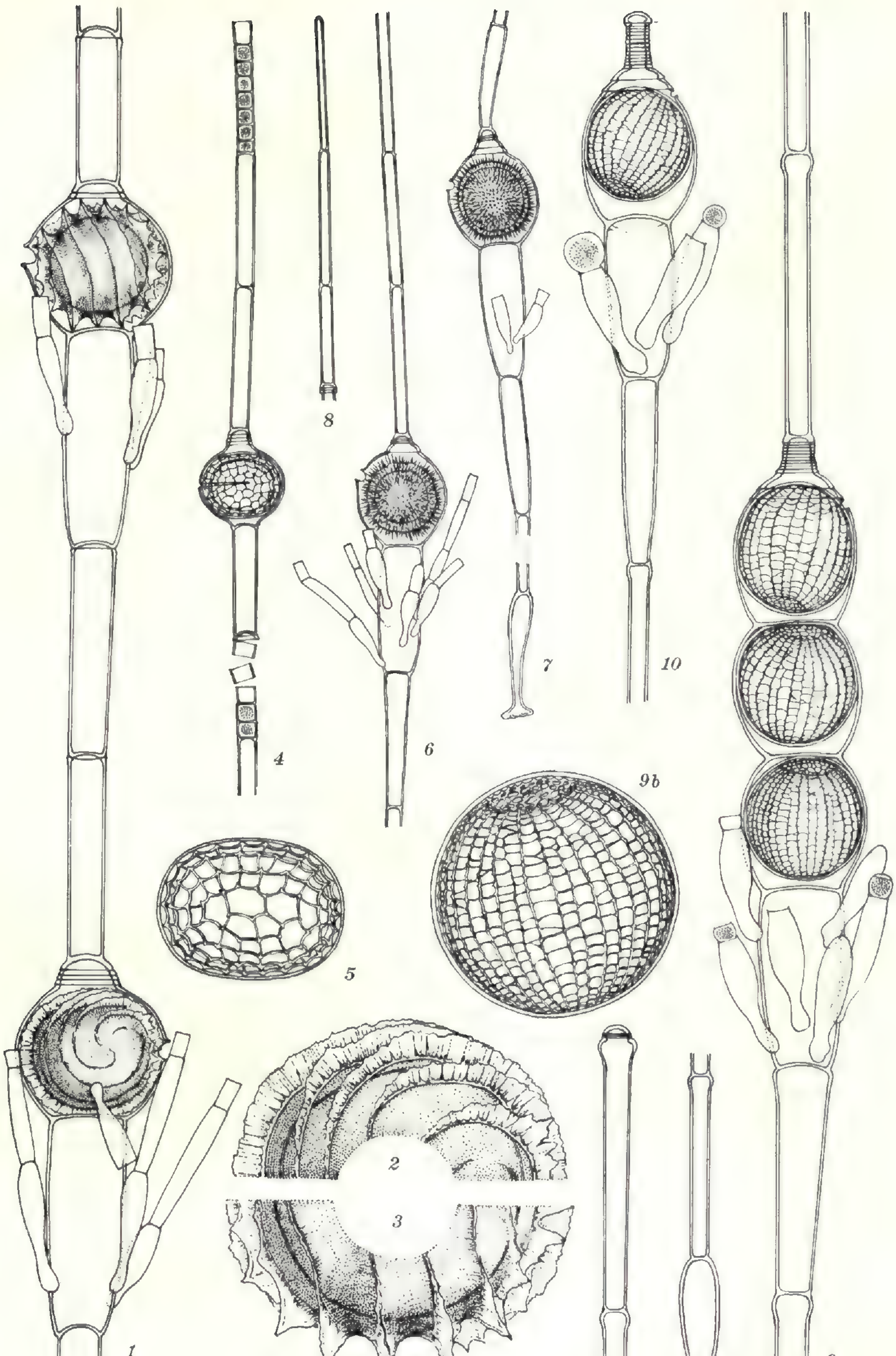
4. OEDOGONIUM ARESCHOUGII Wittrock var. AMERICANUM Tiffany.

Two forms were noted. The first is not exactly like Tiffany's variety, in that the samples show a gynandrosporous habit, lesser dimensions of vegetative cells, and shorter basal cells. Professor Tiffany has suggested to the writer that this variety may be both gynandrosporous and idioandrosporous, and in the other characters also may vary into the range of the Woods Hole material. Full data of the local form are:

Vegetative cells	6.4– 9.6 μ diam.,	23.0–78.4 μ long.
Oogonia	29.0–38.4 μ diam.,	25.6–41.6 μ long.
Oospores	21.0–28.8 μ diam.,	19.2–24.0 μ long.
Androsporangia	8.0– 9.6 μ diam.,	28.8–30.0 μ long.
Antheridia	6.4 μ diam.,	6.4– 8.0 (–9.6) μ long.
Basal cells	9.6–10.0 μ diam.,	28.8–30.0 μ long.

This form was collected in Juncus Pond, Aug. 5, 1933 (*Jao*).

The second form of this plant is idioandrosporous in habit and the dimensions of all portions agree closely with Tiffany's diagnosis, but the vegetative cells are rather shorter, commonly less than 25μ and the greatest length in only a very few cells reaches 61 μ.



Oedogonium spiripennatum, figs. 1–3; Oe. cymatosporum var. areoliferum, figs. 4 and 5; Oe. hystricinum var. excentriporum, figs. 6–8; Oe. Taylorii, figs. 9–12.

This form was collected in a small pond on Pasque Island, July 7, 1933 (*Bosworth*).

5. Oedogonium Areschougii Wittrock var. **contortifilum**, var. nov. (tab. 287, figs. 22–25). Oedogonium dioicum, nannandrium, gynandrosporum; oogoniis 2- vel 7-continuis vel singulis, depresso-globosis, raro subpyriformi-globosis, operculo mediano apertis, circumscissione latere altero lata, altero angusta; oosporis oogoniis conformantibus et lumen complentibus, vel raro partes polares non complentibus, membrana laevi; androsporangiis 1- vel 3(–?)-cellulis plerumque curvatis, subepigynis, raro subhypogynis vel dispersis; nannandribus oboviformibus, unicellulis, in oogoniis sedentibus; cellulis vegetativis capitellatis; saepe ea supra oogonium posita atque cellulis filamenti aliquot aliis curvatis vel spiralibus; cellula basali tumida, breviore quam aliis cellulis vegetativis, raro ad 64 μ longa; cellula terminali apice obtusa.

Cell. veg.	7.5–12 μ diam.,	30–65 μ long.
Oogonia	30.0–33 μ diam.,	26–30 μ long.
Oosporae	26.0–30 μ diam.,	24–26 μ long.
Androsporangia	7.0– 8 μ diam.,	6–12 μ long.
Nannandres	5.0– 7 μ diam.,	9–12 μ long.
Cell. basales	9.6–16 μ diam.,	26–32 μ long.

Dioecious, nannandrous, gynandrosporous; oogonia 1–7, depressed-globose, rarely subpyriform-globose, operculate, division median, one side wide, oospore of same form as the oogonium and filling it, or rarely not filling it longitudinally; spore wall smooth; androsporangia 1–3 (–?), generally curved, subepigynous rarely subhypogynous or scattered; dwarf male obovoid, unicellular, on the oogonium; vegetative cells capitellate, as a rule, the first vegetative cell above the oogonium and some portions of the filament curved or spiral in form; the basal cell enlarged and shorter than the vegetative cell, rarely elongate to 64 μ long; terminal cell apically obtuse.

Weeks' Pond, Aug. 10, 1931, Center Pond. Aug. 12, 1931, Harper Pond, July 3, 1933, and Juncus Pond, Aug. 5, 1933 (*Croasdale*); Harper Pond, Aug. 27, 1933 (*Jao*). Types in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 43, 87, and 89.

The variety differs from the type and other varieties or forms chiefly by its curved to spiral filaments.

6. Oedogonium autumnale Wittrock. Endicott Mire, Aug. 5, 1933 (*Jao*).

7. Oedogonium boreale Hirn var. **americanum** var. nov. (tab. 287, figs. 16–18). Oedogonium dioicum, nannandrium, idioandrosporum; oogoniis singulis vel 2- vel 4-continuis, frequenter terminalibus vel inter cellulas vegetativas sparsis, depresso-globosis vel late pyriformibus, membrana usque ad 5 μ crassitudine et lamellosa, solum in medio meridionaliter undulato-plicatis, operculo apertis, circum-

scissione lata, supra medium, margine paullulum undulato; oosporis subdepresso-globosis vel globosis, oogonia complentibus vel fere complentibus, membrana laevi; cellulis suffultoriis interdum tumidis, majoribus 25.6 μ; filamentis androsporangiis paullulum gracilioribus quam femineis, androsporangiis singulis vel 2- vel 6-cellulis, interdum tumidis; nannandribus unicellulis, late oboviformibus, in oogonia positis; cellulis vegetativis capitellatis, inferioribus gracilioribus quam superioribus; cellula terminali apice obtusa, saepe substitutione oogonii aut androsporangii nulla; cellula basali tumida, non elongata.

Cell. veg. plant. fem.	12.8–19.2 (–22.4) μ diam.,	32.0–70.4 μ long.
Cell. veg. plant. androsp.	12.8–19.2 μ diam.,	35.2–81.6 μ long.
Oogonia	41.6–54.4 μ diam.,	38.4–54.4 μ long.
Oosporae	33.6–41.6 μ diam.,	32.0–40.0 μ long.
Androsporangia	12.8–16.0 μ diam.,	12.8–19.2 μ long.
Nannandres	8.0–12.8 μ diam.,	9.6–12.8 μ long.
Cellulae basales	19.2–22.4 μ diam.,	32.0–57.6 μ long.

Dioecious, nannandrous, idioandrosporous; oogonia 1–4, scattered or more often terminal, depressed-globose to broadly pyriform, wall up to 5 μ thick and lamellose, with 16–22 longitudinally median folds, operculate, division supramedian and wide, margin slightly undulated; oospore subdepressed-globose, nearly or not filling the oogonium, spore wall smooth; suffultory cell sometimes tumid, reaching a diameter of 25.6 μ; androsporangial plant slightly more slender than the female, androsporangia 1–6, often terminal; dwarf male unicellular, broadly obovoid, situated on the oogonium; vegetative cell capitellate, lower cells generally more slender than the upper; terminal cell apically obtuse, often an oogonium of androsporangium; basal cell enlarged, not elongated.

Pasque J Pond, July 19, 1932 (*Croasdale*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 107: 1, 2, and 3.

The species *Oe. boreale* was discovered in Finland by K. E. Hirn, 1900. It is characterized by its large dimensions, thick- and lamellose-walled oogonium. The number of the folds of the oogonium distinguishes it from its nearest relatives, *Oe. megaporum* Wittrock and *Oe. oelandicum* Wittrock & Hirn. In Hirn's description the idioandrosporous habit is given as doubtful, the oogonium is solitary, rarely two, and the folds are from 16 to 19. This new variety is closely related to *Oe. boreale*, but clearly differs from it in having smaller dimensions of all cells, especially the reproductive cells, and the folds as many as 22 in number.

8. OEDOGONIUM BORISIANUM (Le Clerc) Wittrock. In a swamp on Buck Island, July 24, 1921 (*Taylor* in Herb. Taylor No. 3658); Harper Pond, June 26, 1931, July 3, and July 26, 1933 (*Croasdale*), and Aug. 17, 1933 (*Jao*); Wood Pond, Aug. 29, 1931, and Endicott Hollow, Aug. 5, 1933 (*Croasdale*).

The samples in Professor Taylor's Herbarium are nearly pure and very abundant. Dimensions of the vegetative cells are very variable either on different individuals or on same plant. Generally, the upper cells are broader (to 35.2 μ) and shorter than the lower. In each collection two types of basal cells were noted, namely one form slightly tumid and elongate and the other more enlarged and shortened.

9. Oedogonium Boscii (Le Clerc) Wittrock. In a small pond on Pasque Island, July 7, 1933 (*Bosworth*).

10. Oedogonium Boscii (Le Clerc) Wittrock var. occidentale Hirn. Weeks' Pond, Aug. 10, 1931, and Juncus Pond, Aug. 5, 1933, (*Croasdale*); Wall Pond, Aug. 1, and Aug. 8, 1933 (*Croasdale & Jao*).

11. Oedogonium ciliatum (Hassall) Pringsheim. In the writer's samples, the oogonia were usually solitary, rarely two together, division of the operculum was generally nearly supreme, the androsporangia were usually two, and the vegetative cell was small (8–16.4 μ diam., 48–86.4 μ long). This plant was always very short, the whole filament usually less than ten cells in length.

Wall Pond, June 10, and July 5, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*).

12. Oedogonium concatenatum (Hassall) Wittrock. The local plants have ellipsoid, subobovoid-globose, or globose oospores, with the longitudinally arranged pits in about 40–62 series, the suffultory cell and its adjunct vegetative cells curved. The antheridia show alternate unequal development of opposite sides, giving the antheridial series a wavy form. They form two sperms by horizontal division. The dimensions of all cells are a little smaller than those of the typical plant, except that the vegetative cells are shorter and slightly broader. Otherwise this material was like the type. Full data of the local form are listed:

Vegetative cells	25.6–44.8 μ diam.,	64.0–160.0 μ long.
Oogonia	64.0–76.8 μ diam.,	70.4–112.0 μ long.
Oospores	57.6–73.6 μ diam.,	64.0– 83.2 μ long.
Suffultory cells	51.2–60.8 μ diam.,	115.2–134.4 μ long.
Androsporangia	27.2–32.0 μ diam.,	12.8– 32.0 μ long.
Male stipes	16.0–22.4 μ diam.,	52.8– 64.0 μ long.
Antheridia	9.6–12.8 μ diam.,	11.2– 22.4 μ long.

Endicott Mire, Aug. 5, 1933 (*Croasdale*).

13. Oedogonium crassiusculum Wittrock var. idioandrosporum Nordstedt & Wittrock. Club House Pond, June 28, 1932 (*Croasdale*); Barmer Pond, June 27, 1933 (*Jao*). The specimens collected in Barmer Pond have smaller dimensions of all cells and the oogonium very rarely is angular-globose in form. Full data of the form are:

Vegetative cells	19.0–30 μ diam.,	60–103 μ long.
Oogonia	42.0–54 μ diam.,	45– 60 μ long.
Oospores	38.0–52 μ diam.,	41– 52 μ long.
Androsporangia	20.0–26 μ diam.,	10– 26 μ long.

Male stipes	9.5–15 μ diam.,	52– 62 μ long.
Antheridia	7.0–9 μ diam.,	10– 16 μ long.

14. OEDOGONIUM CRENULATOCOSTATUM Wittrock forma CYLINDRICUM Hirn. Harper Pond, July 3, 1933 (*Croasdale*) and Aug. 17, 1933 (*Jao*).

15. OEDOGONIUM CRENULATOCOSTATUM Wittrock var. LONGIARTICULATUM Hansgirg. Harper Pond, Aug. 17, 1933 (*Jao*).

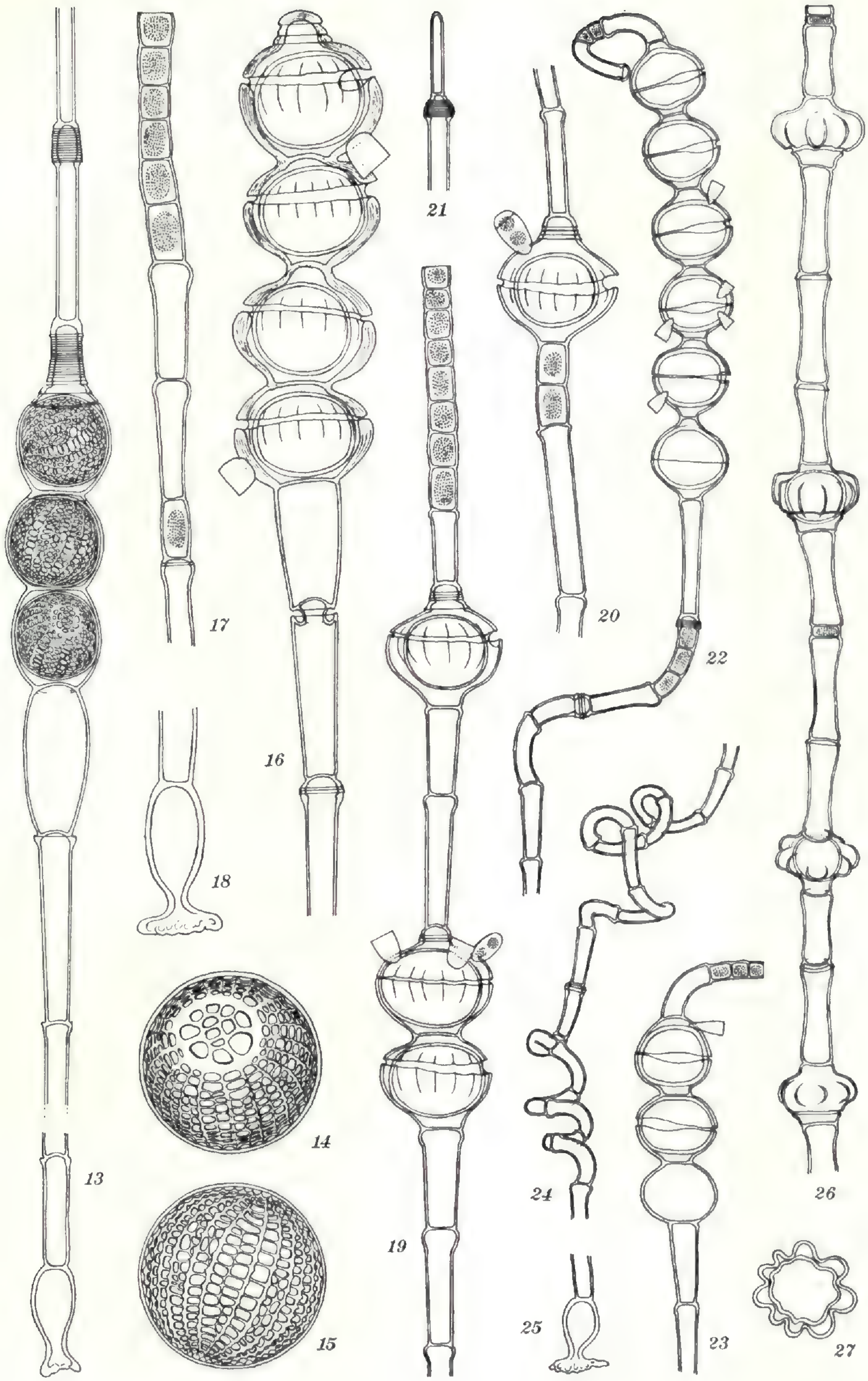
16. OEDOGONIUM CRISPUM (Hassall) Wittrock var. GRACILESCENS Wittrock. Sheep Pen Pond, June 11, 1932, Pasque O Pond, June 7, 1932, Iron Pond, June 26, 1933, Wall Pond, July 5, 1933 (*Croasdale*); Pasque K Pond and another small pond on the same island, June 7, 1933 (*Bosworth*).

17. OEDOGONIUM CRISPUM (Hassall) Wittrock var. URUGUYAYENSE Magnus & Wille. Weeks' Pond, June 28, 1932 (*Croasdale*).

18. **Oedogonium Croasdaleae**, sp. nov. (TAB. 288, FIGS. 31–35). Oedogonium dioicum, nannandrium, gynandrosporum; oogoniis singulis vel bis vel septies continuis, plerumque in parte filamenti superiore positis, quadrangulari-ellipsoideis vel subobovi formibus vel subellipsoideis, operculo apertis, circumscissione superiore, interdum lata; oosporis oogoniis conformantibus et lumen plane vel raro subtus vix complentibus, membrana triplici, episporio extus laevi, mesosporio crasso et lamelloso longitudinaliter costato (in sectione optica transversaliter undulato), costis anastomosantibus, irregulariter undulato, in medio oosporae circa 16–30; endosporio granulato; cellulis suffultoriis tumidis; androsporangiis saepe 8-seriatis, epigynis, raro hypogynis vel subhypogynis; nannandribus cyathiformibus, curvatis, in cellulis suffultoriis vel raro in oogoniis sedentibus, retinaculo irregulariter lobato; antheridiis singulis, interioribus; inferioribus cellulis vegetativis gracilioribus quam superioribus; cellula terminali obtusa saepe a oogonio aut a androsporangio supposita; cellula basali interdum paullulum tumida, retinaculo lobato praedita. Oogonium interdum deest, saepe ab androsporangiis suppositum, sed in filamentis iis absentia oogonii abnormalibus sunt cellulae suffultoriae atque nannandres semper normaliter positi.

Cell. veg.	20–30 μ diam.,	95.0–230.0 μ long.
Oogonia	56–77 μ diam.,	80.0–116.0 μ long.
Oosporae	54–73 μ diam.,	77.0–105.0 μ long.
Cell. suffultoriae	39–72 μ diam.,	70.0–147.0 μ long.
Androsporangia	10–55 μ diam.,	6.4– 76.8 μ long.
Nannandres	10–15 μ diam.,	55.0– 63.0 μ long.

Dioecious, nannandrous, gynandrosporous; oogonia 1–7, generally on the upper portion of the filament, quadrangular-ellipsoid, subobovoid, or subellipsoid, operculate, division superior, sometimes wide; oospore of the same form as the oogonium and filling it, rarely not reaching the lower end, spore membrane of three layers: outer layer smooth, median layer thick and lamellose, with 16–30 anastomosing, irregularly undulate, longitudinal ribs, inner layer granulate;



Oedogonium reticulocostatum, figs. 13–15; Oe. boreale var. americanum, figs. 16–18; Oe. oelandicum var. Novae-Angliae, figs. 19–21; Oe. Areschougii var. contortifilum, figs. 22–25; Oe. platygynum var. ambiceps, figs. 26 and 27.

suffultory cell tumid; androsporangia to 8-seriate, epigynous, rarely hypogynous or subhypogynous; dwarf male goblet-shaped, curved, on the suffultory cell, occasionally on the oogonium, holdfast irregularly lobed, antheridium 1, interior; filaments tapering toward the base; terminal cell obtuse, often an oogonium or androsporangium; basal cell sometimes a little swollen, with a lobed holdfast. Oogonium occasionally absent or poorly developed, often replaced by androsporangia, but the suffultory cell and dwarf males in their usual positions.

This is the only known species which is characterized by a granulate inner spore wall, and also the only nannandrous member of the genus possessing a gynandrosporous habit, superior operculum, longitudinally ribbed oospores, and interior antheridia. It bears some resemblance to *Oe. michiganense* Tiffany. It differs, however, in having larger dimensions, the vegetative cells not being capitellate, in having quadrangular-ellipsoid, subobovoid, or subellipsoid oogonia and oospores, with a larger number of ribs, and granulate inner spore-wall. It also looks like members of the "cyathigerum" and "Wolleanum" group. It is distinguished clearly by its operculate character and granulate inner spore-wall.

Harper Pond, June 26 and Aug. 10, 1931, and July 3, 1933 (*Croasdale*) and Aug. 27, 1933 (*Jao*); Wood Pond, Aug. 10 and 29, 1931, Wall Pond July 7, 1932, and Pasque J Pond, July 19, 1932 (*Croasdale*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 40–45 and 87.

19. OEDOGONIUM CRYPTOPORUM Wittrock. Salt Pond, Aug. 11, 1931 (*Croasdale*); Chara Pond, July 23, 1933 (*Jao*); Pasque K Pond, July 7, 1933 (*Bosworth*); a pond on Naushon Island, July 17, 1917 (*Taylor*, in Herb. Taylor, No. 2565).

20. OEDOGONIUM CRYPTOPORUM var. VULGARE Wittrock. Stone Wall Pond, June 11, 1932, Iron Pond, June 26, 1933, Harper Pond, July 3, 1933, and Juncus Pond, Aug. 5, 1933 (*Croasdale*); Wall Pond, Aug. 17, 1933 (*Jao*); a pond on Naushon Island, July 17, 1917 (*Taylor* in Herb. Taylor, No. 2565).

The dimensions of the Wall Pond specimens are rather larger than those of the plants which were collected from other localities.

21. OEDOGONIUM CYMATOSPORUM Hirn var. **areoliferum**, var. nov. (TAB. 286, FIGS. 4, 5). Oedogonium monoicum; oogoniis singulis, depresso-globosis, poro mediano rimiformi apertis; oosporis forma oogoniis similibus et ea complentibus, membrana triplici; episporio et endosporio laevi, mesosporio areolato (in sectione optica undulato); antheridiis 4- vel 7-cellularibus, subepigynis, subhypogynis vel dispersis; spermatozoidiis singulis; cellula terminali obtusa.

Cell. veg.	6.4– 9.6 μ diam.,	25.6–64.0 μ long.
Oogonia	28.8–32.0 μ diam.,	25.6–41.0 μ long.
Oosporae	25.6–28.8 μ diam.,	19.2–25.6 μ long.
Antheridia	6.4– 9.6 μ diam.,	6.4– 9.6 (–12.8) μ long.

Monoecious; oogonium solitary, depressed globose, pore median, rimiform; oospore similar in form to the oogonium and filling it, the spore wall of three layers: the outer and inner smooth, the middle areolate; antheridia 4–7, subepigynous, subhypogynous or scattered; sperm single; terminal cell obtuse.

This variety shows some characteristics of *Oe. cymatosporum* Wittrock & Nordstedt, but is distinguished chiefly by its areolate median spore wall, constantly depressed-globose oogonia and oospores, and smaller dimensions of the fruiting cells. The illustration given by Hirn shows a foveolate rather than an areolate spore wall, and Tiffany's figure conforms. In the familiar species of this genus which are characterized by monoecious habit and a median rimiform pore, no areolate spore types have previously been found. The only monoecious representatives of the genus with reticulate oospores are *Oe. dictyosporum* Wittrock and its forma *Westii* Tiffany. This new variety is distinguished from these in having the pore median, fruiting cells depressed, an areolate median spore-wall, and lesser dimensions.

Wall Pond, June 10, and July 5, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 67, 68, 90, and 91.

22. OEDOGONIUM ECHINOSPERMUM Braun. Wall Pond, Aug. 1, 1933, (*Croasdale*); Aug. 17, 1933 (*Jao*).

23. OEDOGONIUM ELEGANS West & West var. **americanum**, var. nov. (TAB. 288, FIGS. 28–30). Oedogonium dioicum, nannandrium, gynandrosporum vel (?) idioandrosporum; oogoniis singulis operculo apertis, circumscissione medianis; oosporis depresso-globosis, oogonia complentibus; membrana laevi; androsporangiis 1–2, subhypogynis vel sparsis, paullulum tumidis; spermatozoidiis singulis; cellulis vegetativis, androsporangiis, et oogoniis dense et minute granulatis, granulis spiraliter dispositis; cellulis vegetativis expanse capitellatis; cellula terminali apice obtusa; cellula basali subhemisphaerica vel depresso-globosa; membrana verticaliter plicata.

Cell. veg.	4.8– 8.0 μ diam.,	25.6–67.8 μ long.
Oogonia	27.2–32.0 μ diam.,	24.0–27.2 μ long.
Oosporae	20.8–28.8 μ diam.,	19.2 μ long.
Androsporangia	8.0– 9.6 μ diam.,	9.6–12.8 μ long.
Cell. basalis	14.4–17.0 μ diam.,	11.5–13.0 μ long.

Dioecious, nannandrous, gynandrosporous or idioandrosporous (?); oogonium solitary, depressed-globose, operculate, division median; oospore depressed-globose, filling the oogonium or not, spore-wall

smooth; androsporangia 1–2, subhypogynous or scattered, generally a little tumid; vegetative cells, oogonis, and androsporangia densely and minutely granulate, the granules spirally arranged; vegetative cells broadly capitellate; terminal cell apically obtuse; basal cell subhemispherical to depressed-globose; wall vertically plicate.

The species *Oe. elegans* is found only in Ceylon as reported by West. In the description and drawings only the vegetative cells are marked by minute granules and the capitellate character of the vegetative cells was not pointed out, though suggested by the slight lateral swelling of a few cells in his figures. This variety is clearly characterized by its broadly capitellate vegetative cells and the granulate oogonia, androsporangia, and vegetative cells.

Salt Pond, Aug. 11, 1931 (*Croasdale*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 108: 1 — 5.

24. OEDOGONIUM GLOBOSUM Nordstedt. Salt Pond, Aug. 11, 1931, (*Croasdale*).

25. OEDOGONIUM GRANDE Kuetzing & Wittrock. This is one of the most common Oedogonia occurring in the region. Fresh Pond, Sept. 1, 1929, (in Herb. Taylor No. 15037); Stone Wall Pond, June 11, 1932, Harper Pond, June 26, and July 29, 1931 and July 26, 1933, Club House Pond, June 11, 1932, Wall Pond, July 7, 1932, and Endicott Hollow, Aug. 26, 1933, (*Croasdale*); Sheep Pond, June 27, and Harper Pond, Aug. 17, 1933, (*Jao*). This species was also reported from Long Pond, Falmouth, July 1895, by C. P. Cott, in Collins, Holden and Setchell: Phycotheca Boreali-Ameridana No. 519.

26. OEDOGONIUM GRANDE Kuetzing & Wittrock var. ANGUSTUM Hirn. Harper Pond, July 3, 1933, Stone Wall Pond, July 7, 1933, and Endicott Hollow, Aug. 5, 1933 (*Croasdale*); Harper Pond, Aug. 17, 1933, (*Jao*).

27. OEDOGONIUM HYSTRICINUM Transeau & Tiffany var. **excentriporum**, VAR. NOV. (TAB. 286, FIGS. 6–8). Oedogonium dioicum, nannandrium, (?) idioandrosporum; oogonio solitario, oboviformi-globoso, poro supra medium aperto; oosporis subglobosis vel globosis, oogonia complentibus, raro vix complentibus, membrana triplici: mesosporio et endosporio laevi, episporio dense echinato; cellulis suffultoriis tumidis; nannandribus paullulum curvatis, in cellulis suffultoriis sedentibus, stipite interdum bi- vel tricellulari; cellula basali interdum subtumida non elongata; cellula terminali obtusa.

Cell. veg.	6.0– 8.0 μ diam.,	40.0–94 μ long.
Oogonia	22.0–35.0 μ diam.,	38.0–48 μ long.
Oosporae (C. echin.)	27.0–32.0 μ diam.,	32.0–35 μ long.
Cell. suffultoriae	12.0–19.5 μ diam.,	47.0–54 μ long.
Nannadrium stipes		
Cell. inferior	5.0– 6.5 μ diam.,	10.0–21 μ long.
Cell. superior	3.5– 6.5 μ diam.,	9.5–26 μ long.
Cell antherid	5.0– 6.0 μ diam.,	5.0–12 μ long.

Dioecious, nannandrous, (idioandrosporous ?); oogonium solitary, obovoid-globose, pore supramedian, oospore subglobose to globose, filling the oogonoium, rarely nearly filling it, spore-wall of three layers: median and inner layers smooth, outer layer densely echinate; suffultory cell swollen; dwarf male slightly curved, on the suffultory cell, stipe 1- to 3-celled; antheridium 1, exterior; basal cell sometimes a little tumid, not elongate; terminal cell obtuse.

This variety distinctly belongs to *Oe. hystricinum* Transeau & Tiffany in having the densely echinate oospore and swollen suffultory cell, but is clearly differentiated from the type, by the smaller dimensions of its vegetative cells, pore not median, male stipes 1- to 3-celled, and basal cell not elongated.

Harper Pond, June 3, 1933 (*Croasdale*) and Aug. 17, 1933, (*Jao*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 43 and 47.

28. OEDOGONIUM INTERMEDIUM Wittrock. Wood Pond, Aug. 10, 1931 and Salt Pond, Aug. 11, 1931 (*Croasdale*).

29. OEDOGONIUM INVERSUM Wittrock. Deer Pond, July 7, 1932 (*Croasdale*); Chara Pond, June 23, 1933 (*Jao*); a pond on Naushon Island, July 17, 1917 (*Taylor* in Herb. Taylor No. 2565).

30. OEDOGONIUM MACRANDIUM Wittrock var. PROPINQUUM (Wittrock) Hirn. Long Pond, June 14, 1933 (*Croasdale*).

31. OEDOGONIUM MAMMIFERUM Wittrock & Nordstedt. Sheep Pen Pond, July 5, 1931, Deer Pond, July 7, and Sept. 11, 1932, and Wall Pond, June 5, 1933 (*Croasdale*); Chara Pond, June 23, 1933 and Sheep Pond, June 27, 1933 (*Jao*).

32. OEDOGONIUM MINUS Wittrock. The dimensions are a little smaller than those of the typical forms. The oospore sometimes fills the oogonium, and the vegetative cells are distinctly capitellate. The full data are:

Vegetative cells	4.8–12.8 μ diam.,	25.6–84.0 μ long.
Oogonia	32.2–44.8 μ diam.,	35.2–41.6 μ long.
Oospores	28.8–38.4 μ diam.,	22.4–35.2 μ long.
Antheridia	12.0–13.0 μ diam.,	3.2– 9.6 μ long.

Wall Pond, Aug. 17, 1933 (*Jao*).

33. OEDOGONIUM MITRATUM Hirn. Chara Pond, June 22, 1933 (*Jao*).

34. OEDOGONIUM NOBILE Wittrock var. MINUS Hirn. The dimensions of this local form are not exactly like the typical plants with respect to the reproductive cells. The antheridia range up to 6-seriate. The full data are:

Vegetative cells	12.8–22.4 μ diam.,	114.0–173.0 μ long.
Oogonia	57.6–60.8 μ diam.,	96.0– 80.0 μ long.
Oospores	54.4–57.6 μ diam.,	70.4– 73.6 μ long.
Antheridia	16.0–17.6 μ diam.,	6.4– 12.8 μ long.

Endicott Mire, Aug. 5, 1933 (*Croasdale*).

35. Oedogonium oelandicum Wittrock & Hirn var. **Novae-Angliae**, var. nov. (tab. 287, figs. 19–21). Oedogonium dioicum, nannandrium, gynandrosporum; oogoniis 2- vel 4-continuis vel singulis, depresso-globosis, in medio plicatis, plicis ?–16 aequatorialibus verticillatis, nondum regionem polarem attingentibus, operculo supra medium circumcisso, margine undulata; oosporis oogoniis conformantibus et lumen plane complentibus, raro (praecipue longitudinaliter) non complentibus, membrana laevi; cellulis suffultoriis saepe tumidis; androsporangiis 2- vel 7-cellularibus vel unicellularibus, subepigynis, hypogynis, vel sparsis; nannandribus oboviformibus, unicellularibus, in oogoniis sedentibus; spermatozoidiis binis, divisione horizontali natis; cellulis vegetativis capitellatis; cellula basali tumida; cellula terminali apice obtusa, interdum quam cellulis vegetativis tenuiore.

Cell. veg.	9.6–16 μ diam.,	32.5–86.0 μ long.
Oogonia	40.0–51 μ diam.,	33.0–43.2 μ long.
Oosporae	35.0–43 μ diam.,	30.0–36.0 μ long.
Cell. suffult.	13.0–20 μ diam.,	30.0–64.0 μ long.
Androsporangia	11.0–14 μ diam.,	9.0–17.0 μ long.
Nannandres	8.0–10 μ diam.,	9.5–13.0 μ long.

Dioecious, nannandrous, gynandrosporous; oogonia 1—4, depressed-globose, with ?–16 longitudinal median plicae, operculate, division supramedian, margin undulate; oospore of the same form as the oogonium and filling it, rarely a little shorter and not filling it completely, spore-wall smooth; suffultory cell sometimes tumid; androsporangia 1–7 (–?), subepigynous, hypogynous, or scattered; dwarf male obovoid, unicellular, seated on the oogonium; sperms 2, division horizontal; vegetative cells capitellate; basal cell enlarged; terminal cell apically obtuse, sometimes more slender than the vegetative cells.

This variety is characterized by its large dimensions, especially of the fruiting cells, which serve to distinguish it from the type form of the species and from f. *minus* Børge. It also bears some resemblance to *Oe. megaporum* Wittrock, *Oe. costatum* Transeau, and *Oe. boreale* Hirn. It differs, however, from the first by its larger oogonia and oospores, from the second by the lesser dimensions of its female fruiting cells, the oogonium 1- to 4-seriate, and in that the verticillate folds of the oogonium do not reach to poles, and from the third in having lesser dimensions, and the oogonial wall not thick and lamellose.

Harper Pond, July 3, 1933, and Endicott Mire, Aug. 5, 1933 (*Croasdale*), and by *Jao* at the first station, Aug. 27, 1933. Types in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 40–50 and 87.

36. Oedogonium platygynum Wittrock. Silver Beach Pond, Sept. 1, 1933 (*Croasdale*).

37. OEDOGONIUM PLATYGYNUM Wittrock var. **ambiceps**, var. nov. (TAB. 287, FIGS. 26, 27). Oedogonium dioicum, nannandrium, gynandrosporum; oogoniis singulis, depresso-globosis, in medio plicis 8–10 verticillatis, elongatis, obtuse rotundatis instructis, operculo apertis, circumscissione infra medium, margine undulata vel recta; oosporis subglobosis vel globosis, interdum depresse lateque costatis, costis brevibus verticillatis; oosporis oogoniis conformantibus, oogonia omnino vel raro vix complentibus (plicationibus oogonii exceptis); membrana laevi; androsporangiis 1–vel 2-cellularibus, subepigynis vel subhypogynis; cellula vegetativa distincte utrinque capitellata.

Cell. veg.	9.6–12.8 μ diam.,	22.4–41.6 μ long.
Oogonia	32.0–38.4 μ diam.,	22.4–28.8 μ long.
Oosporae	19.2–25.6 μ diam.,	19.2–22.4 μ long.
Androsporangia	11.2–12.8 μ diam.,	3.2 μ long.

Dioecious, nannandrous, gynandrosporous; oogonium solitary, depressed-globose, with 8–10 long rounded projections arranged in a whorl about the middle, operculate, the division inframedian, margin undulate or straight; oospore subglobose to globose, sometimes with low projections like those of the oogonium, quite or rarely nearly filling the oogonium exclusive of the projections, spore-wall smooth; androsporangia 1–2, subepigynous or subhypogynous; vegetative cells distinctly capitellate at bothends.

This variety is characterized chiefly by the large dimensions of its oogonia and oospores and in that its vegetative cells are capitellate at both ends, in these points differing from the type and the other form and variety.

Juncus Pond, Aug. 5, and Wall Pond, June 5, 1933 (*Croasdale*); Wall Pond, Aug. 17, 1933 (*Jao*). TYPES in the writer's collections and Herb. Univ, Mich., Woods Hole Nos. 89–91.

38. OEDOGONIUM PRATENSE Transeau. Pasque K Pond, June 7, 1933 (*Bosworth*); Wall Pond, July 5, 1933 (*Croasdale*).

39. OEDOGONIUM PUSILLUM Kirchner. Sheep Pen Pond, July 5, 1933 (*Croasdale*).

40. OEDOGONIUM PUNGENS Hirn. Weeks' Pond, Aug. 10, 1933 (*Croasdale*).

41. OEDOGONIUM REINSCHII Roy. Sheep Pond, June 27, 1933 (*Jao*).

42. **Oedogonium reticulocostatum**, sp. nov. (TAB. 287, FIGS. 13–15). Oedogonium dioicum; oogoniis 2- vel 8-continuis vel singulis, globosis, vel subglobosis, vel subobovi formi-globosis, superne circumscissis, operculo minimo, interdum latiusculo; oosporis globosis, maturitate aurantiacis, oogonia complentibus, interdum longitudinaliter non complentibus, membrana triplici; episporio et endosporio laevi, mesosporio longitudinaliter costato (in sectione optica undulato), costis denticulatis et incrassatis, in medio oosporae 10–22, inter se transverse costulatis, interdum anastomosantibus reticula-

tionem distinctam formantibus, pro parte marginem disci polaris non attingentibus, regione polari reticulata disciformi, axe transverso vel obliquo; cellulis suffultoriis tumidis; cellulis vegetativis paullum capitellatis, cum acutis angulis superioribus; cellula terminali obtusa vel anguste conica; cellula basali tumida. Planta mascula ignota.

Cell. veg.	8.0–16.0 μ diam.,	44.8–86.4	μ long.
Oogonia	(25.8–) 28.8–36.7 μ diam.,	32.0–46.0 (–72)	μ long.
Oosporae	(23–) 27.2–32.0 μ diam.,	27.2–32.0	μ long.
Cell. suffult.	22.4–25.6 μ diam.,	44.8–57.6	μ long.

Dioecious; oogonia 1–8, globose, subglobose, or subobovoid-globose, operculate, division supreme, narrow; oospore globose, orange at maturity, filling the oogonium, except sometimes the length, spore-wall of three layers, the outer and inner smooth, the median layer with 10–22 longitudinal, toothed and thickened ribs, connected by transverse, sometimes anastomosing lines to from coarse reticulations; polar region reticulate, disc-shaped; polar axis transverse or oblique to the axis of filament; ribs in part not reaching the margin of the polar disk; suffultory cell swollen; vegetative cells slightly capitellate the upper angles acute; the terminal cell apically obtuse to sharply conical; the basal cell enlarged. Male plant unknown.

This species is characterized by the supreme position of the operculum, and by the longitudinally toothed ribs which join directly to the margins of the discoid polar areas and are connected by transverse lines to form a reticulum, which serves to distinguish these plants from the group of *O. monile*, to which this species is probably most nearly related.

Collected in a small pond on Pasque Island, July 7, 1933 (*Bosworth*). Type in the writer's collections and Herb. Univ. Mich., Woods Hole No. 64.

43. Oedogonium rugulosum Nordstedt. Details additional to the description in Tiffany's monograph are: this species is gynandrosporous, androsporangium usually solitary, hypogynous, a little swollen, 6 — 7.5 μ diam., and 10 — 11 μ long, terminal cell apically obtuse, or replaced by an oogonium; the basal cell slightly enlarged; commonly epiphytic on other species of Oedogonium or other algae.

Iron Pond, June 26, 1933, Wall Pond, July 19, 1932, and Endicott Mire and Juncus Pond, Aug. 5, 1933 (*Croasdale*); Harper Pond, July 3 and 26, 1933 (*Croasdale and Jao*).

The specimens collected in Harper Pond were slightly larger than those collected from other stations.

44. Oedogonium Sancti-Thomae Wittrock & Cleve (?). Harper Pond, Aug. 17, 1933 (*Jao*).

45. Oedogonium sexangulare Cleve. Salt Pond, Aug. 11, 1931, Weeks' Pond, Aug. 10, 1931, and Harper Pond, June 26, and July 29, 1931 and June 3 and July 26, 1933 (*Croasdale*); Harper Pond, Aug. 17, 1933 (*Jao*).

46. OEDOGONIUM SEXANGULARE Cleve var. MAJUS Wille. Harper Pond, June 26 and Aug. 29, 1931, June 3 and July 26, 1933 and Iron Pond, June 26, 1933 (*Croasdale*); Harper Pond, Aug. 17, 1933 (*Jao*).

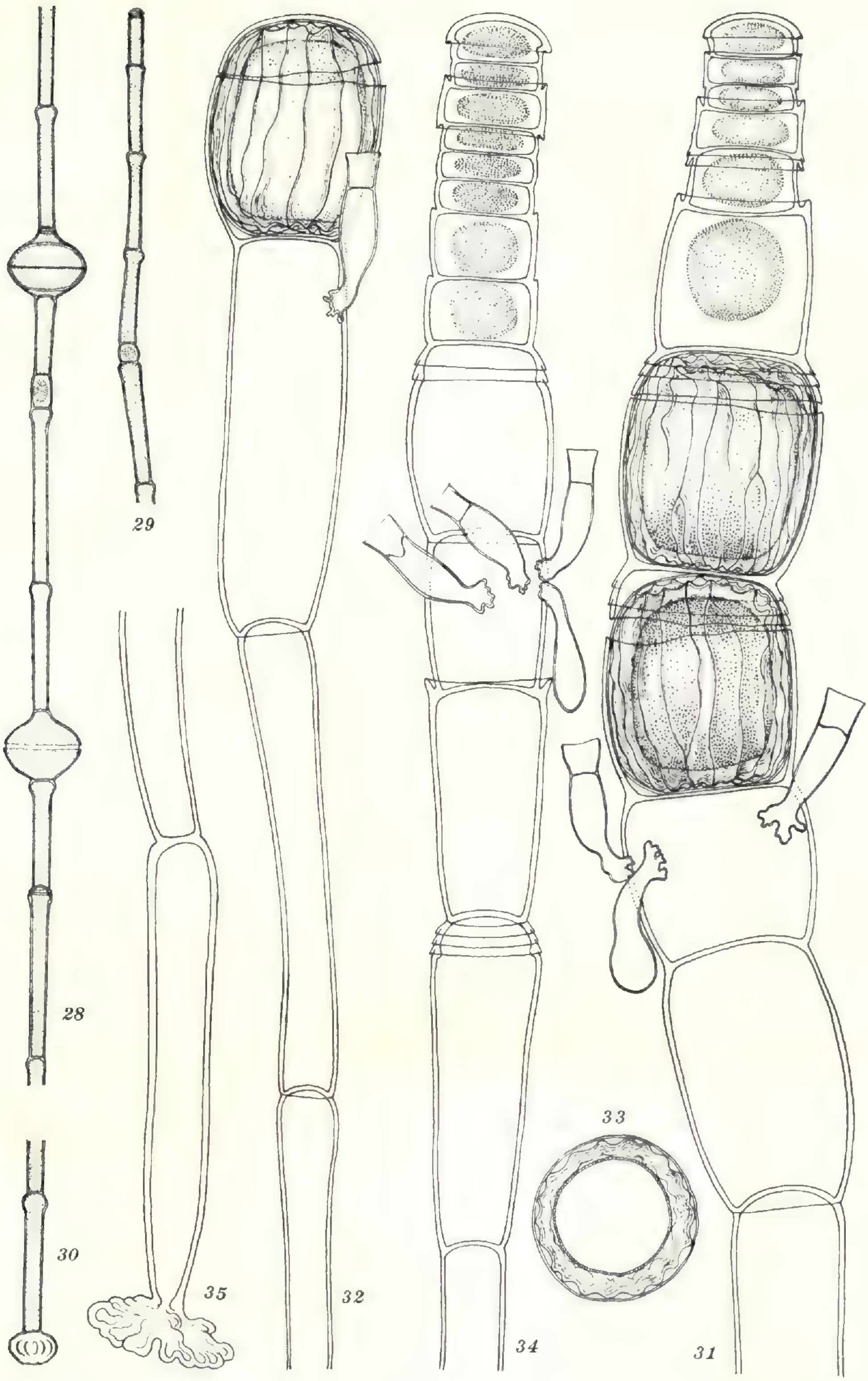
47. **Oedogonium spiripennatum**, sp. nov. (TAB. 286, FIGS. 1–3). Oedogonium dioicum, nannandrium, (?) idioandrosporum; oogoniis singulis, subglobosis vel oboviformi-globosis, poro mediano apertis; oosporis globosis vel subglobosis, oogonia complentibus, membrana triplici: episporio subtiliter granulato-costato, costis, 5–7 spiralibus dentatis membranaceo-alatis, ad polos inter se anastomosantibus; axe semper transversali; cellulis suffultoriis tumidis; nannandribus paullulum curvatis, in cellulis suffultoriis sedentibus, stipite 1- vel 2-cellulari; antheridio exteriore, unicellulari; spermatozoidiis singulis; cellulis vegetativis inferioribus gracilioribus quam superioribus; cellula basali paullulum tumida, retinaculo lobato; cellula terminali obtusa.

Cell. veg.	16.0–22.4 μ diam.,	44.8–89.6 μ long.
Oogonia	48.0–57.6 μ diam.,	48.0–61.0 μ long.
Oosporae	44.8–54.4 μ diam.,	41.6–51.2 μ long.
Cell. suffult.	25.6–32.0 μ diam.,	64.0–80.0 μ long.
Nannand. stipes		
Cell. superior	6.4– 8.0 μ diam.,	38.4–48.0 μ long.
Cell. inferior	9.6–12.8 μ diam.,	35.2–44.8 μ long.
Antheridia	6.4– 9.0 μ diam.,	5.0–16.0 μ long.
Cell. basalis	19.2 μ diam.,	60.8 μ long.

Dioecious, nannandrous, idioandrosporous (?); oogonium solitary, subglobose to obovoid-globose, pore median, oospore globose or subglobose, filling the oogonium, spore-wall of three layers: the median and inner smooth, the outer layer finely granulate, with 5 — 7 spiral, toothed, membranous-winged ribs uniting at the poles; the polar axis always placed in a transverse position, never parallel with the filament; the suffultory cell swollen; the dwarf male a little curved, on the suffultory cell, rarely on the oogonium or near by the suffultory cell; stipe cells 1 — 2; antheridium 1, exterior; sperm 1; lower vegetative cells of the filament generally more slender than the upper, but the basal cell slightly enlarged, with a lobed holdfast; terminal cell apically obtuse.

This species is near *Oe. illinoisense* Transeau and *Oe. spiralidens* Jao. It differs, however, from the first in having membranous-winged ribs on a granulate outer spore-wall, the male stipe cells 1 — 2, antheridium 1, vegetative cells larger, and reproductive cells rather smaller, especially the cells of the dwarf male plants, and from the second, in having membranous-winged ribs, male stipe 1- to 2-celled, antheridium 1, and in its larger dimensions.

Wall Pond, June 10 and July 5, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 67, 68, 90, and 91.



Oedogonium elegans var. americanum, figs. 28–30; Oe. Croasdaleae, figs. 31–35.

48. Oedogonium suecicum Wittrock. Dune Pond (south), June 24, 1931, Iron Pond, June 26, 1933 (*Croasdale*); Wall Pond, Aug. 17, 1933 (*Jao*). The specimens from Iron Pond are a little smaller than the typical form.

49. Oedogonium tapeinosporum Wittrock. Wall Pond, Aug. 17, 1933 (*Jao*).

50. **Oedogonium Taylorii**, sp. nov. (tab. 286, figs. 9–12). Oedogonium dioicum, nannandrium, idioandrosporum; oogoniis singulis vel 2- vel 3-continuis, globosis vel ellipsoidali-globosis, poro superiore apertis; oosporis globosis, raro subellipsoidali-globosis, oogonia complentibus vel partes polares non complentibus, membrana triplici: episporio etiamque endosporio laevi, mesosporio longitudinaliter costato (in sectione optica transversaliter undulato), costis crenulatis vel dentatis, in medio oosporae 22–28, inter se costulis distinctis transversalibus, interdum anastomosantibus conjunctis, costis paucis ad polos non attingentibus, regione polari disciformi et reticulata, axe cum eo filamenti directione fere continente; cellulis suffultoriis tumidis; androsporangiis 1- vel 4-seriatis, terminalibus; nannandribus in cellulis suffultoriis sedentibus, stipite paullulum curvato, antheridiis exterioribus, unicellulis, globosis, prope apicem operculo dehiscentibus; spermatozoidiis singulis; cellulis vegetativis latiusculis capitellatis; cellula terminali obtusa, in filamentis femineis frequenter substitutione oogonii nulla; cellula basali tumida, retinaculo irregulariter lobato substrato affixa.

Cell. veg.	8.0–19.2 μ diam.,	38.4–112.0 μ long.
Oogonia	35.2–51.2 μ diam.,	46.4– 73.6 μ long.
Oosporae	32.0–46.2 μ diam.,	32.0– 51.2 μ long.
Cell. suffult.	32.0–33.6 μ diam.,	54.4– 73.6 μ long.
Androsp.	16.0–17.6 μ diam.,	16.0– 22.8 μ long.
Stip. nannandr.	9.6–12.8 μ diam.,	48.0– 51.2 μ long.
Antheridia	6.4(–16) μ diam.,	4.8– 6.4 μ long.
Cell. basalis	12.8–19.2 μ diam.,	48.0– 89.6 μ long.

Dioecious, nannandrous, idioandrosporous; oogonia 1–3, globose or ellipsoid-globose, with superior pore; oospore globose, very rarely subellipsoid-globose, partly or completely filling the oogonium, spore-wall of three layers: the outer and inner smooth, the middle with 22–28 crenulate to slightly dentate, longitudinally continuous ribs, connected by transverse, sometimes anastomosing lines, some ribs not continued to the polar regions; polar regions disc-shaped and reticulate in structure, polar axis nearly parallel to the filament; suffultory cell enlarged; androsporangia 1–4 (–?), mostly terminal on the filament; dwarf male a little curved, on the suffultory cell; antheridium 1, exterior, globose, dehiscing by an operculum near the apex; sperm single; vegetative cell capitellate, not very broad; terminal cell obtuse, on the female plant sometimes becoming an oogonium; basal cell enlarged, with an irregularly lobed attachment.

In this genus only *Oe. michiganense* Tiffany is characterized by

possessing a capitellate vegetative cell, a subapical operculum, and longitudinally ribbed oospores. The new species is distinguished from this, however, in having an idioandrosporous habit, peculiar features of spore-wall and dwarf male, and smaller dimensions of all cells.

Fawn Pond, June 18, and July 14, 1933 (*Croasdale*); Aug. 17, 1933 (*Jao*). TYPES in the writer's collections and Herb. Univ. Mich., Woods Hole Nos. 95–97.

51. OEDOGONIUM UNDULATUM (Brebisson) Al. Braun forma SENEGALENSE (Nordstedt) Hirn (subforma). This Oedogonium was found in a pool near West Chop, Martha's Vineyard, Massachusetts by *W. J. V. Osterhout* in 1883. In Hirn's "Monographie der Oedogoniaceen" (p. 261, Tab. XLV, Fig. 277) this type is described as a subform of f. *senegalense*. It differs from the latter in having the vegetative cell with four deep constrictions, the three median swellings secondarily constricted and the terminal two entire, and oogonia 1- to 5-seriate, The Woods Hole specimens are exactly like Hirn's description and figure, except that the oogonia are 1- to 2-seriate and the dwarf males are shorter (26–33 μ long).

Sheep Pen Pond, July 5, 1933 and Salt Pond, Aug. 11, 1931 (*Croasdale*); Pasque K Pond, June 7, 1933 (*Bosworth*).

This investigation was initiated at the Marine Biological Laboratory, Woods Hole and carried to completion in the Department of Botany, University of Michigan, Ann Arbor, Michigan, under the direction of Professor Wm. R. Taylor, to whom the writer is deeply grateful for his advice; the writer wishes also to thank the collectors for material, especially Miss H. T. Croasdale, and Professor L. H. Tiffany for his valuable suggestions as to the new forms.

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EXPLANATION OF PLATES

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FIGS. 1–3. OEDOGONIUM SPIRIPENNATUM Jao, sp. nov. FIG. 1, part of the filament, with two oogonia containing oospores in lateral view (upper)

and polar view (lower), and the dwarf males on the suffultory cells (× 315); FIG. 2, part of oospore, showing the granulate outer spore-wall with the toothed and membranous-winged ribs in polar view (× 630); FIG. 3, same as FIG. 2, in lateral view (× 630).

FIGS. 4, 5. OEDOGONIUM CYMATOSPORUM Hirn VAR. AREOLIFERUM Jao, VAR. NOV. FIG. 4, part of the filament, with one oogonium and two series of antheridia in the subhypogynous and scattered positions (× 315); FIG. 5, an oospore, showing the areolate median spore-wall (× 630).

FIGS. 6–8. OEDOGONIUM HYSTRICINUM Transeau & Tiffany VAR. EXCENTRIPORUM Jao, VAR. NOV. FIG. 6, part of the filament, with one oogonium and six dwarf males on the swollen suffultory cell, two of these have the stipes 2- or 3-celled (× 315); FIG. 7, part of the filament, showing one oogonium, two dwarf males, and a slightly tumid basal cell (× 315); FIG. 8, an upper part of the filament, showing the obtuse terminal cell (× 315).

FIGS. 9–12. OEDOGONIUM TAYLORII Jao, sp. nov. FIG. 9, part of the filament, with three oogonia and six dwarf males, two of which are immature (× 315); FIG. 9b, an oospore, showing the characteristics of the median spore-wall (× 630); FIG. 10, upper part of the filament, showing the terminal oogonium and three dwarf males (× 315); FIG. 11, terminal cell (× 315); FIG. 12, basal cell (× 315).

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FIGS. 13–15. OEDOGONIUM RETICULOCOSTATUM Jao, sp. nov. FIG. 13, part of the filament, showing three oogonia either in lateral view (upper two) or polar view (lower one), and the swollen basal cell (× 315); FIG. 14, oospore in polar view (× 630); FIG. 15, oospore in lateral view (× 630).

FIGS. 16–18. OEDOGONIUM BOREALE Hirn VAR. AMERICANUM Jao, VAR. NOV. (× 315). FIG. 16, upper part of the filament, showing a series of terminal oogonia, two broad unicellular dwarf males on the oogonia, and a vegetative cell in a division stage below the suffultory cell; FIG. 17, part of the filament, with two series of androsporangia; FIG. 18, basal cell.

FIGS. 19–21. OEDOGONIUM OELANDICUM Wittrock VAR. NOVAE-ANGLIAE Jao. VAR. NOV. (× 315). FIG. 19, part of the filament showing two series of oogonia, the subepigynous androsporangia, and the dwarf males, one of which contains two sperms; FIG. 20, part of the filament, with an oogonium, a mature dwarf male, and two hypogynous androsporangia; FIG. 21, terminal cell.

FIGS. 22–25. OEDOGONIUM ARESCHOUGII Wittrock VAR. CONTORTIFILUM Jao, VAR. NOV. (× 315). FIG. 22. Part of the filament, with six oogonia, two series of androsporangia, and five dwarf males on the oogonia, showing the curved cells; FIG. 23, part of the filament, showing the curved portion above the oogonia. This form is very commonly found with fruiting filaments; FIG. 24, part of the filament, showing the spiral characteristic; FIG. 25, basal cell.

FIGS. 26, 27. OEDOGONIUM PLATYGYNUM Wittrock VAR. AMBICEPS Jao, VAR. NOV. (× 360). FIG. 26, part of the filament, showing four solitary oogonia and two subepigynous and one subhypogynous androsporangia; FIG. 27, oospore in polar view, showing the projections on both the oogonium and oospore.

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FIGS. 28–30. OEDOGONIUM ELEGANS West & West VAR. AMERICANUM Jao, VAR. NOV. (× 315). FIG. 28, part of the filament, with two solitary oogonia and a subhypogynous androsporangium; FIG. 29, upper part of the filament showing the terminal cell and an isolated androsporangium; FIG. 30, basal part of the filament, showing the depressed-globose and vertically plicate basal cell.

FIGS. 31–35. OEDOGONIUM CROASDALEAE Jao, sp. nov. (× 315). FIG. 31, upper part of the filament, with two oogonia, six epigynous androsporangia, and three dwarf males, one of which is immature; FIG. 32, upper part of the filament, showing the terminal oogonium; FIG. 33, median part of the oospore seen in polar view, showing the thickened, lamellose, and undulate median wall between smooth outer and finely granulate inner walls; FIG. 34, upper part of the filament, showing a poorly developed oogonium and the suffultory cell, dwarf males, and androsporangia in their usual condition.

SOME FEATURES OF THE FLORA OF THE OZARK REGION IN MISSOURI[1]

JULIAN A. STEYERMARK

To the student of phytogeography the area comprised in the state of Missouri offers a field of exceptional interest mainly on account of the great diversity of its physiographic features, which are the result of its long geological history as a land area. Within the limits of the state are found the low-lying swamp region of the southeast, the comparatively smooth or slightly rolling prairie mostly north of the Missouri River, and south of that great watercourse the vast semi-mountainous, heavily forested Ozark Plateau. The geology of the region is equally diverse. The area to the north of the Missouri River is covered by a nearly continuous sheet of glacially transported soils, clays and gravels, mostly of Kansan drift material, whereas to the south of this stream lies an ancient unglaciated region, the Ozark Plateau, consisting of sedimentary rocks of Paleozoic age with an ancient igneous core of Pre-cambrian origin, the entire Ozark region being one of the oldest land areas on this continent. The Ozark area, together with the Boston Mountains of northern Arkansas and eastern Oklahoma and the Ouachita Mountains of western Arkansas and central Oklahoma, become conspicuous, consequently, as the only prominent series of elevations lying between the Appalachians and the Rocky Mountains to the east and west, and between the Great Lakes and the Gulf of Mexico to the north and south.

It is thus apparent that Missouri should possess a flora of exceedingly diverse elements. It is a cosmopolitan area, botanically speaking, both as a result of this diversity and also because it lies within a definite transition zone where several distinct floristic provinces meet. The Prairie and Great Plains floras enter the region from the west and north; the Coastal Plain and swamp floras from the south and

[1] Published with aid to RHODORA from the National Academy of Sciences.

southeast penetrate the southeast corner of the state; the semi-arid flora of the southwest protrudes slightly into the southern portion; some of the ancient southern Appalachian upland floras appear in various places in the Ozark Plateau; and finally, some of the elements of the Canadian flora from the north and northeast descends into the state, intermixed with the more common Alleghanian element, constituting a truly heterogeneous assemblage of floras of widely diverse origins in time and place.

A general survey of the flora within this area reveals the still more striking and interesting fact that a considerable portion of the flora is a restricted one from the standpoint of distribution within the state. Of course, many of the species have a more or less general range in Missouri; nevertheless, for a large number of them the area of dispersal is restricted. Such limited distribution is often associated directly with a definite type of habitat. Some of the more important explanations that may account for the restriction in habitat and distribution of a species living under its present environmental conditions are that (1) the habitat was selected because the species found in it the optimum conditions for survival—perhaps a definite relationship between soil and water, chemical or physical nature of the substratum, evaporation-exposure ratio, percentage of relative light and shade, etc.; (2) present climatic and physiographic zones—affected by prevailing winds, distribution of rainfall and temperature, relief features, proximity to the sea, altitude, types of substrata, and many other factors; resulting in turn from the past geological history of the land—may have influenced or even forced the species to adapt itself to the conditions and to establish itself there; (3) past geological history may have determined its present known range by the effects of glaciation, diastrophism and orogeny, flooding by continental seas, etc.—that is, a restricted species may be living in territory geologically youthful or may be a relic or endemic because it has been confined within an area geologically more ancient which escaped glaciation or which was not encroached upon by continental seas, or was not influenced, as were surrounding areas, by various forces of diastrophism, orogeny, etc., or it may be an ancient endemic because it survived in a nunatak region; or it may be localized because it is too old to move and has lost its aggressiveness, a fact often shown in many of Dr. Fernald's studies, particularly in his treatise[1] "The

[1] Fernald, M. L. Persistence of plants in unglaciated areas of Boreal America. Mem. Am. Acad. 15: 239–342. 1925.

Persistence of Plants in Unglaciated Areas" etc. In the case of a given species one or all of these explanations may be needed to account for the present habitat and distribution. In many cases, the geological history may have served as the basic reason for isolating the species in certain areas; in other cases, the geological history may have been the primary cause in isolating the species in a general region, but subsequent causes, such as changes in climatic and physiographic zones, or soil relationships, etc., may have been the secondary and, perhaps, final issue in further limiting the habitat and distribution. There are so many phases to this subject that but a few can be briefly discussed in the present paper.

In connection with the flora of the Ozark region it would appear that geological history has fundamentally determined the broader relationships of the floristic elements, but that other factors have secondarily modified and confined to narrower limits the present native flora. One of the seemingly most important reasons in accounting for certain types of distribution of species found in the Ozark region as well as elsewhere is the chemical nature of the substratum and its associated phenomena. Where other conditions in the environment remain relatively constant in a given region, the soil factor often becomes the deciding one, particularly in regions of residual soils. Dr. Wherry has often brought out the strong correlation existing between the distribution of a species and the chemical nature of the substratum in his numerous studies on soil acidity. Dr. Fernald has often emphasized the chemical nature of the soil as important in the study of plant distribution, and in the case of certain North American species of alpine and subalpine plants has correlated their present distribution with lithological factors.[1] Again, in the area of residual rocks in the Mineral Springs region of Adams County, Ohio, Dr. E. L. Braun[2] found a very striking correlation between the distribution of the various species and the underlying rock component. The summary of this work is as follows: "The most striking correlation between vegetation and any environmental feature of the Mineral Springs region, is the relation of plant communities to underlying rock. The physical and chemical properties of the soils—the available water, the colloidal content, the H-ion,

[1] Fernald, M. L. The soil preferences of certain alpine and subalpine plants. RHODORA **9**: 149–193. 1907.

[2] Braun, E. L. Vegetation of the Mineral Springs region, Adams county, Ohio. Ohio Biol. Surv. Bull. **15**: 513. 1928.

and perhaps, indirectly, the nitrogen content—are affected by or are derivatives of the original rock materials. The primary classification of the vegetation on a geological basis is an acceptance of the importance of this influence which remains apparent throughout all successions." The famous soil chemist, Hilgard,[1] defined a calcareous soil as one which supported a calcicolous vegetation, and one of his chief claims was that the type of soil becomes an important and frequently a decisive factor in determining the distribution of a particular species. Field geologists often recognize the importance of the vegetational covering, and are able frequently to locate definite substrata and horizons by noting certain plant species.

The unglaciated Ozark region in Missouri is one of residual soils arranged in belts of varying width which conform to each geological formation represented. Briefly stated, the southeast portion of the state contains the Archaean rocks which are the oldest in the Mississippi Basin; these rocks are chiefly granites, rhyolites, and porphyritic trachytes. These igneous rocks are found nowhere else in Missouri except for an isolated occurrence in Camden County. Around this ancient igneous core, which forms the nucleus for later formations, occur successively younger and younger sedimentary strata, comprising limestones, dolomites, shales, sandstones, and cherts. These younger rocks surround the igneous core in ring-like belts of varying width and irregularity. The youngest rocks exposed around the margin of the Ozark belt are those of Pennsylvanian age, whereas the oldest, lying immediately about the igneous core, date back to Cambrian. This concentric character of the distribution of Paleozoic formations surrounding the igneous mass is much better developed on the east than on the west slope of the crystalline area. A subordinate center around which the rings are deflected lies in Camden and Laclede counties. Rocks of Cambrian and Ordivician age occupy most of the area of the Ozark Dome in Missouri. Due to this concentric arrangement of the formations the distances by which similar types of rock are separated from each other may be quite marked. Sandstones of one age may be isolated from those of another by intervening outcrops of other types of rocks. For example, a straight line drawn in the southeastern Ozark region in Missouri, from Perryville, Perry Co., southwest to Eminence, in Shannon Co., reveals the occurrence of limestones, dolomites, chert, sandstone,

[1] Hilgard, E. W. Soils: their formation, properties, composition, and relations to plant growth in the humid and arid regions. p. 593. New York. 1907.

and porphyritic trachyte, which, because of their general concentric arrangement in relation to the igneous core, appear in restricted belts.

As found in many other areas of residual soil, rocks of diverse chemical composition result in chemically dissimilar soils, and these, in turn support divergent types of plant associations. However, the occurrence of various species on a definite substratum is well marked in Missouri only when the plant is closely associated with the substratum, i. e., when the residual soil is thin and thus retains the marked chemical properties of the substratum. Conversely, a residual soil which, as a result of much disintegration by weathering and sufficient accumulation of organic matter, has reached a certain depth where it ceases to be little or not at all influenced by the chemical nature of the rock substratum, usually supports species of a more general range whose occurrence is not necessarily limited to the underlying substratum. Soils of this type, often occurring in the deeper deposits of woods, fields, meadows, etc., are frequently circumneutral, and may result from rocks of very dissimilar chemical properties. In such types of soils the factor of acidity or alkalinity in limiting the vegetation is mostly eliminated, or, at least, decidedly counteracted by other factors associated therewith. On these mostly circumneutral types of soils occur many of the common Missouri plants of fields, meadows, and woods. Such woodland species as *Erigenia bulbosa*, *Dentaria laciniata*, *Dicentra Cucullaria*, *Anemone virginiana*, *Sanicula canadensis*, *Uvularia grandiflora*, etc., are in this class, and they frequent circumneutral soils which are sufficiently deep, rich, moist, and shaded, regardless of whether the area is one of limestone, sandstone, chert, or granite. Such species, as well as many others of similar habitat, have a more or less general range over the state, probably because the conditions under which they develop are themselves widespread. It is in connection, however, with the species in Missouri which in their distribution within the state occur locally, irregularly, or in conformation to a particular kind of substratum that the soil factor assumes importance. As stated elsewhere, rocks of either basic or acidic properties may give rise to circumneutral soils. Alkaline soils in Missouri result from limestone areas, whereas the acid soils are derived from sandstone, chert, granite, or porphyritic trachyte. Depending upon the degree of leaching which has occurred, both acidic and basic types of soils may result from dolomite or magnesian limestone areas. The acidic condition is produced by

extensive leaching, whereby most, if not all, of the calcium carbonate is washed out, leaving the magnesium element in excess. When there is no pronounced amount of leaching the resulting substratum is mostly alkaline. In Missouri, but in the Ozark region in particular, two main types of distribution of species in relation to certain soils are found. One large group comprises the oxylophytes, or, in other words, those confined to or favoring areas of acidic rocks. The other group includes the calciphiles, or those which occur in areas of limestone or other calcareous rocks, and which seem to favor or be restricted to such rocks.

The oxylophytes make up a large proportion of the flora of the sandstone, chert, granite, and porphyritic trachyte areas, especially of the barrens formed by the weathering of these rocks. A list of some typical oxylophytes in Missouri comprises the following:—

Polypodium virginianum L.
Pteridium latiusculum (Desv.) Hier. var. pseudocaudatum (Clute) Maxon
Cheilanthes lanosa (Michx.) Watt
Asplenium pinnatifidum Nutt.
Asplenium Trichomanes L.
Asplenium Bradleyi D. C. Eaton
Thelypteris palustris (Salisb.) Schott var. pubescens (Lawson) Fernald
Thelypteris marginalis (L.) Nieuwl.
Thelypteris spinulosa (O. F. Müll.) Nieuwl. var. intermedia (Muhl.) Nieuwl.
Dennstaedtia punctilobula (Michx.) Moore
Osmunda regalis L. var. spectabilis (Willd.) Gray
Osmunda cinnamomea L.
Lycopodium lucidulum Michx.
Lycopodium complanatum L. var. flabelliforme Fernald
Selaginella rupestris (L.) Spring
Isoëtes melanopoda J. Gay
Pinus echinata Mill.
Erianthus divaricatus (L.) Hitchc.
Andropogon Elliottii Chapm.
Andropogon saccharoides Sw.
Andropogon ternarius Michx.
Sorghastrum nutans (L.) Nash
Digitaria villosa (Walt.) Pers.
Paspalum stramineum Nash
Panicum depauperatum Muhl.
Panicum perlongum Nash
Panicum linearifolium Scribn.
Panicum dichotomum L.
Panicum sphaerocarpon Ell.
Panicum Scribnerianum Nash
Panicum scoparium Lam.
Aristida dichotoma Michx.
Aristida basiramea Engelm.
Aristida ramosissima Engelm.
Aristida longespica Poir.
Aristida intermedia Scribn. & Ball
Aristida lanosa Muhl.
Aristida oligantha Michx.
Aristida purpurascens Poir.
Muhlenbergia tenuiflora (Willd.) BSP.
Muhlenbergia capillaris (Lam.) Trin.
Sporobolus Drummondii (Trin.) Vasey
Agrostis Elliottiana Schultes
Danthonia spicata (L.) Beauv.
Festuca octoflora Walt.
Gymnopogon ambiguus (Michx.) BSP.
Tricuspis elongatus (Buckl.) Nash
Cyperus inflexus Muhl.
Cyperus retrofractus (L.) Torr.
Cyperus filiculmis Vahl var. macilentus Fern.
Fimbristylis Vahlii (Lam.) Link
Scirpus carinatus Gray
Hemicarpha micrantha (Vahl) Pax
Rynchospora capitellata (Michx.) Vahl
Scleria pauciflora Muhl.
Scleria ciliata Michx.
Carex hirsutella Mack.
Carex varia Muhl.
Juncus polycephalus Michx.
Juncus aristulatus Michx.

Luzula campestris (L.) DC.
var. bulbosa A. Wood
Smilax glauca Walt.
Hypoxis hirsuta (L.) Coville
Habenaria peramoena Gray
Spiranthes gracilis (Bigel.) Beck
Goodyera pubescens (Willd.) R. Br.
Carya alba (L.) K. Koch
Carya ovalis Sarg.
var. obovalis Sarg.
Carya Buckleyi Dur.
var. arkansana Sarg.
Quercus marilandica Muench.
Quercus coccinea Muench.
Quercus stellata Wang.
Quercus velutina Lam.
Alnus rugosa (Du Roi) Spreng.
Rumex hastatulus Baldw.
Rumex Acetosella L.
Polygonum tenue Michx.
Polygonum sagittatum L.
Polygonella americana (Fisch. & Mey.) Small
Froelichia floridana (Nutt.) Moq.
Froelichia gracilis Moq.
Anychia polygonoides Raf.
Geocarpon minimum Mack.
Cerastium arvense L.
var. oblongifolium (Torr.) Hollick & Britton
Cerastium viscosum L.
Talinum parviflorum Nutt.
Talinum calycinum Engelm.
Portulaca retusa Engelm.
Portulaca pilosa L.
Ranunculus Harveyi (Gray) Britton
Selenia aurea Nutt.
Sedum Nuttallianum Raf.
Sullivantia renifolia Rosendahl
Saxifraga pennsylvanica L.
var. Forbesii (Vasey) Engl. & Irmsch.
Saxifraga virginiensis Michx.
Desmodium rotundifolium (Michx.) DC.
Desmodium sessilifolium (Torr.) T. & G.
Desmodium rigidum (Ell.) DC.
Desmodium obtusum (Muhl.) DC.
Lespedeza procumbens Michx.
Lespedeza repens (L.) Pers.
Lespedeza striata (Thunb.) H. & A.
Lespedeza hirta (L.) Hornem.
Clitoria mariana L.
Galactia volubilis (L.) Britton
Rynchosia latifolia Nutt.
Polygala verticillata L.
Linum sulcatum Riddell
Linum striatum Walt.
Crotonopsis elliptica Willd.
Acalypha gracilens Gray
var. monococca Engelm.
Tragia cordata Michx.
Ilex verticillata (L.) Gray
var. padifolia (Willd.) T. & G.
Ilex opaca Ait.
Vitis rotundifolia Michx.
Ascyrum hypericoides L.
Hypericum petiolatum Walt.
Hypericum gentianoides (L.) BSP.
Hypericum Drummondii (Grev. & Hook.) T. & G.
Helianthemum Bicknellii Fern.
Lechea villosa Ell.
Lechea tenuifolia Michx.
Viola pedata L.
Viola sagittata Ait.
Viola pallens (Banks) Brainerd
Rhexia mariana L.
Rhexia interior Pennell
Oenothera linifolia Nutt.
Chaerophyllum Tainturieri Hook.
var. floridanum Coult. & Rose
Spermolepis echinata (Nutt.) Heller
Cynosciadium pinnatum DC.
Daucus pusillus Michx.
Nyssa sylvatica Marsh.
Nyssa aquatica L.
Monotropa uniflora L.
Monotropa Hypopitys L.
Rhododendron roseum (Loisel.) Rehder
Vaccinium arboreum Marsh.
var. glaucescens (Greene) Sarg.
Vaccinium stamineum L.
Vaccinium virgatum Ait.
var. tenellum (Ait.) Gray
Vaccinium vacillans Kalm
var. crinitum Fern.
Steironema quadriflorum (Sims) Hitchc.
Polypremum procumbens L.
Frasera caroliniensis Walt.
Apocynum androsaemifolium L.
Phlox bifida L.
Isanthus brachiatus (L.) BSP.
Trichostema dichotomum L.
Hedeoma hispida Pursh
Pycnanthemum incanum (L.) Michx.
Pycnanthemum albescens T. & G.
Cunila origanoides (L.) Britton
Linaria vulgaris Hill
Linaria canadensis (L.) Dumont
var. texana (Scheele) Pennell
Chelone glabra L.
Aureolaria grandiflora (Benth.) Pennell
var. serrata (Torr.) Pennell

Aureolaria flava (L.) Farw.
var. macrantha Pennell
Aureolaria calycosa (Mack. & Bush) Pennell
Aureolaria pectinata (Nutt.) Pennell
var. ozarkensis Pennell
Agalinis heterophylla (Nutt.) Small
Agalinis purpurea (L.) Pennell
Agalinis viridis (Small) Pennell
Plantago aristata Michx.
Plantago virginica L.
Plantago elongata Pursh
Galium arkansanum Gray
Galium pilosum Ait.
Diodia teres Walt.
Mitchella repens L.
Houstonia caerulea L.
Houstonia patens Ell.
Houstonia minima Beck
Houstonia ciliolata Torr.
Valerianella longiflora (T. & G.) Walp.
Liatris squarrosa Willd.
Chrysopsis camporum Rydb.
Solidago petiolaris Ait.
var. Wardii (Britton) Fern.
Solidago caesia L.
Solidago hispida Muhl.
Solidago nemoralis Ait.
Solidago radula Nutt.
Solidago leptocephala T. & G.
Aster patens Ait.
Aster anomalus Engelm.
Aster pilosus Willd.
var. demotus Blake
Aster linariifolius L.
Erigeron pulchellus Michx.
Erigeron divaricatus Michx.
Antennaria plantaginifolia (L.) Richards.
Antennaria fallax Greene
Gnaphalium purpureum L.
Gnaphalium obtusifolium L.
Gnaphalium obtusifolium L.
var. micradenium Weatherby
Ambrosia bidentata Michx.
Coreopsis pubescens Ell.
Helenium tenuifolium Nutt.
Artemisia caudata Michx.
Senecio plattensis Nutt.
Krigia Dandelion (L.) Nutt.
Krigia virginica (L.) Willd.
Hieracium scabrum Michx.
Hieracium Gronovii L.

There is a considerable amount of difference in the degree of toleration of various plants to acidity, and some of the species listed as oxylophiles above may in other places be found extending their range into areas of circumneutral soils.

More rarely are the oxylophytes in this flora confined to one type of rock or to a particular geological formation. So far as is known, *Lycopodium lucidulum* and var. *porophilum*, *Saxifraga pennsylvanica* var. *Forbesii*, *Thelypteris palustris* var. *pubescens*, and others occur only in sandstone regions. Even more unusual are those oxylophytes confined to but one geological formation. For example, *Viola pallens*, *Goodyera pubescens*, *Dennstaedtia punctilobula*, and *Lycopodium complanatum* var. *flabelliforme* have been found only on the La Motte sandstone, a formation which occurs chiefly in a few counties around the crystalline area in southeast Missouri. *Saxifraga pennsylvanica* var. *Forbesii* and *Sullivantia renifolia* are known only from the St. Peter sandstone area, which circumscribes a narrow but continuous belt along the eastern and northeastern border of the Ozark Dome. The various sandstone areas, particularly the St. Peter and La Motte formations, seem to harbor a more peculiar and restricted flora, species of great rarity or localized occurrence in Missouri, than either the chert or igneous areas. The Roubidoux

sandstone, which is the most widely distributed sandstone formation in the Ozark region, occupies a large area in the central Ozark region and persists as the surface rock over some large areas. It is the prevailing surface rock over the extensive sandstone plateau of Dent and adjacent counties. It is the formation which underlies much of the pine forest area in many of the southeastern Ozark counties. Being so widely distributed as a surface or near-surface formation in the Ozark region, it is the chief factor in extending the range of many oxylophytes over a larger area. It is very significant that many calciphiles which in Missouri are found only on limestone or dolomite areas are absent from this area underlain by Roubidoux sandstone. *Grindelia lanceolata* is a typical calciphile, and in Missouri is confined to the Ozark region, but is known only from limestone or dolomite glades or rocky prairies. Abundant on the limestone areas that cap the surface in southwestern Missouri, particularly on the Joachim and Jefferson City limestones, it occurs locally elsewhere in the Ozark region only on limestone north to Camden Co. and east to Jefferson Co. In between, in the portion of the central Ozark Plateau underlain by Roubidoux sandstone, it is entirely absent. *Grindelia lanceolata* is a good example of this sort of interrupted distribution because of intervening sandstone areas occupying the surface formation, and a considerable number of other species in the Ozark region show a similar restriction.

Similarly, the areas of calcareous rock in the Ozark region support a definite and restricted flora. The best examples of this calcicolous type of vegetation are found on the limestone glades and bald knobs. These edaphic areas maintain a characteristic xerophytic flora, some of the species of which are found on the limestone glades of the southern Alleghanies and adjacent plateau regions, limestone areas in Arkansas and eastern Oklahoma, and on portions of the Edwards Plateau and adjacent plateau sections of Texas. A number of species exhibit this type of distribution, as, for example, *Grindelia lanceolata* and *Ophioglossum Engelmanni*. Many of the species occurring on the limestone and dolomite barrens in Missouri are also found on circumneutral to calcareous soils of the prairies of Kansas, Nebraska, Oklahoma, Iowa, Illinois, and adjacent areas. An enumeration of such species includes many of the Leguminosae, Compositae, and Gramineae, such as *Liatris scariosa*, *Bouteloua curtipendula*, *Koeleria cristata*, *Silphium laciniatum*, *S. integrifolium*, *Brauneria pallida*,

Solidago rigida, Astragalus distortus, A. mexicanus, Petalostemum purpureum, P. candidum, Amorpha canescens, Psoralea tenuiflora var. *floribunda, P. esculenta,* etc.

The flora of the limestone glades comprises two heterogeneous elements. One group consists of the typical calciphiles. These are the species having, for the most part, deep roots which penetrate the unleached lower portions of the calcareous substratum and are, consequently, influenced directly by the chemical nature of the rock itself. This group of species is characteristic of the calcareous barrens in Missouri and the prairies in other states. The second group is not at all typical of the limestone barrens and knobs; its component species are those which possess, for the most part, shallow root systems that do not penetrate the deeper portions of the substratum but merely occur within the superficial leached areas of the glade. Such root systems do not penetrate the chemically active parts of the substratum, and are therefore not influenced by alkalinity. This second group of species, then, really comprises true oxylophytes which are characteristically found on the acidic chert, sandstone, or igneous barrens in Missouri, but which also occur on the sterile, leached-out, superficial portions of the calcareous substratum. Such, for example, are *Talinum calycinum* and *Crotonopsis elliptica.* The same sort of situation has been recorded in a number of other areas. For example, in the account of his botanical expedition in Newfoundland, Dr. Fernald,[5] writing of the Blomidon talus-slopes, states, "The freshly broken talus was slightly calcareous and had some of the common calciphiles, but the weathered rock from which the soluble lime had leached was carpeted in patches with the plants we are used to on our granitic mountains, and *Phyllodoce caerulea* was here seen for the first time in the entire summer, and *Stipa canadensis* was apparently new to the island."

A list of typical calciphiles in Missouri includes the following:—

Adiantum Capillus-veneris L.
Notholaena dealbata (Pursh) Kunze
Cheilanthes Feei Moore
Pellaea atropurpurea (L.) Link
Pellaea glabella Mett.
Asplenium resiliens Kunze
Asplenium cryptolepis Fernald
Camptosorus rhizophyllus (L.) Link
Cystopteris bulbifera (L.) Bernh.
Ophioglossum Engelmanni Prantl
Isoëtes Butleri Engelm.
Juniperus virginiana L.
Muhlenbergia cuspidata (Torr.) Rydb.
Spartina Michauxiana Hitchc.
Bouteloua hirsuta Lag.
Bouteloua gracilis (HBK.) Lag.
Melica mutica Walt.

[1] Fernald, M. L. A botanical expedition to Newfoundland and Southern Labrador. Contr. Gray Herb., N. S. 40 [or Rhodora **13**]: 133. July, 1911.

Carex eburnea Boott
Carex Crawei Dewey
Zygadenus chloranthus Richards.
Allium stellatum Ker.
Allium mutabile Michx.
Yucca glauca Nutt.
Agave virginica L.
Nemastylis acuta (Bart.) Herb.
Juglans nigra L.
Quercus macrocarpa Michx.
Oxybaphus albidus (Walt.) Sweet
Arenaria patula Michx.
Hepatica acutiloba DC.
Anemone cylindrica Gray
Trautvetteria carolinensis (Walt.) Vail
Clematis Fremontii Wats.
Aquilegia canadensis L.
Delphinium Treleasei Bush
Delphinium Nortonianum Mack. & Bush
Draba cuneifolia Nutt.
Lesquerella gracilis (Hook.) Wats.
Leavenworthia uniflora (Michx.) Britton
Arabis hirsuta (L.) Scop.
Arabis laevigata (Muhl.) Poir.
Descurainia intermedia (Rydb.) Daniels
Erysimum asperum DC.
Heuchera puberula Mack. & Bush
Heuchera parviflora Bartl.
Parnassia grandifolia DC.
Ribes odoratum Wendl.
Malus coronaria (L.) Mill.
Acacia angustissima (Mill.) Kuntze var. hirta (Nutt.) Robinson
Baptisia australis (L.) R. Br.
Cladrastis lutea (Michx. f.) Koch
Psoralea tenuiflora Pursh var. floribunda (Nutt.) Rydb.
Psoralea argophylla Pursh
Psoralea esculenta Pursh
Petalostemum purpureum (Vent.) Rydb.
Petalostemum candidum Michx.
Astragalus mexicanus A. DC.
Astragalus distortus T. & G.
Astragalus lotiflorus Hook.
Oxytropis plattensis Nutt.
Croton capitatus Michx.
Andrachne phyllanthoides (Nutt.) Muell. Arg.
Euphorbia zygophylloides Boiss.
Euphorbia dictyosperma Fisch. & Mey.
Cotinus americana Nutt.
Ilex decidua Walt.
Sapindus Drummondii H. & A.
Rhamnus lanceolata Pursh
Rhamnus caroliniana Walt.
Cissus incisa (Nutt.) Des Moulins
Oenothera missourensis Sims
Oenothera serrulata Nutt.
Gaura coccinea Pursh
Stenosiphon linifolius (Nutt.) Britton
Mentzelia oligosperma Nutt.
Lomatium daucifolium (Nutt.) Coult. & Rose
Eryngium yuccifolium Michx.
Polytaenia Nuttallii DC.
Zizia aurea (L.) Koch
Taenidia integerrima (L.) Drude
Bumelia lanuginosa (Michx.) Pers.
Diospyros virginiana L.
Diospyros virginiana var. platycarpa Sarg.
Gentiana puberula Michx.
Gentiana Andrewsii Griseb.
Centaurium texense (Griseb.) Fernald
Asclepiodora viridis (Walt.) Gray
Acerates viridiflora Ell.
Evolvulus argenteus Pursh
Lithospermum canescens (Michx.) Hitchc.
Heliotropium tenellum (Nutt.) Torr.
Onosmodium subsetosum Mck. & Bush
Onosmodium hispidissimum Mack.
Scutellaria Bushii Britton
Satureia glabella (Michx.) Briquet
Pentstemon Cobaea var. purpureus Pennell
Galium virgatum Nutt.
Houstonia angustifolia Michx.
Campanula rotundifolia L.
Viburnum rufidulum Raf.
Liatris scariosa Willd.
Grindelia lanceolata Nutt.
Grindelia squarrosa (Pursh) Dunal
Gutierrezia dracunculoides (DC.) Blake
Aplopappus ciliatus (Nutt.) DC.
Solidago Gattingeri Chapm.
Solidago Drummondii T. & G.
Solidago rigida L.
Aster oblongifolius Nutt.
Aster sericeus Vent.
Aster laevis L.
Aster azureus Lindl.
Aster ptarmicoides T. & G.
Silphium laciniatum L.
Silphium terebinthinaceum Jacq.
Silphium integrifolium Michx.
Berlandiera texana DC.
Parthenium integrifolium L.
Parthenium repens Eggert

Rudbeckia fulgida Ait.
Brauneria pallida (Nutt.) Britton
Brauneria paradoxa Norton
Marshallia caespitosa Nutt.
Palafoxia callosum T. & G.
Thelesperma trifidum (Poir.) Britton
Thelesperma gracile (Torr.) Gray
Cacalia tuberosa Nutt.

Rarely do the calciphiles occur on acidic rocks. *Aquilegia canadensis, Carex eburnea, Cystopteris bulbifera, Adiantum Capillus-Veneris, Camptosorus rhizophyllus*, and other calcicolus species have been found on the highly siliceous St. Peter and La Motte sandstones, but in these cases some calcium carbonate may have been introduced extraneously, perhaps washed down from above, brought in from seepage-water, or otherwise introduced.

The foregoing discussion has called attention to some obvious general relationships existing between various species in Missouri and the underlying substratum. There is another aspect of this relationship which should be suggested, namely, the frequent association of a species at or near the margin of its range with a definite habitat. The interesting feature observed here is that a number of such species in Missouri are found on a marginal habitat at variance with that in which they occur in the other portions of their range which are near the dispersal center. This divergence between a marginal habitat and one near the center of dispersal for the species is well brought out in the following cases. The most common examples are species which in their usual and most abundant areas of distribution grow in acid swamps, wet woods and meadows, boggy ground, and the like. Species frequenting such habitats in their normal areas of distribution inhabit in Missouri regions of moist shaded cliffs or wet ledges of an acidic nature. The acid substratum usually selected by these species is sandstone. The following species exemplify this point:—1) SAXIFRAGA PENNSYLVANICA var. FORBESII.—Typical *Saxifraga pennsylvanica* of the northern and eastern states is a plant of wet woods and meadows. On coming south into Illinois, and Missouri it is replaced by the closely related *Saxifraga pennsylvanica* var. *Forbesii* which appears only on moist shaded sandstone cliffs. 2) VIOLA PALLENS—A common enough species of wet springy ground and brooksides in the northern and eastern portion of its range, it appears in Missouri at the southwestern limit of its dispersal in but one place known, that on moist La Motte sandstone cliffs.

Other examples illustrate the occurrence of species which appear in the swampy lowlands of southeastern Missouri and persist in

scattered areas north of this region on acidic substrata. *Osmunda cinnamomea* and *O. regalis* var. *spectabilis* both are species common in wet woods, meadows, or swamps in the greater portion of their range. In Missouri they are found in such habitats in the lowlands of the southeastern portion of the state; yet northward in the state the only places where they seem to thrive are crevices and pockets of moist shaded or mossy sandstone, granitic, or porphyritic trachyte cliffs, or along rocky streams of these substrata. *Polypodium polypodioides*, a species of the lowlands of the South Atlantic states, Gulf Coastal Plain, and Mississippi Embayment dispersal, is common on trees in the southeastern lowland region of Missouri: north and west of this area it protrudes frequently further on various sandstone, granites, and porphyritic trachytes, reaching its northernmost known occurrence in the state on a shaded bluff of St. Peter sandstone. *Mitchella repens*, a common plant either of dry sterile acid woods, thickets, and pastures, or acid peaty places in the northern and eastern portions of its range, and frequently in swampy localities in the Gulf Coastal Plain and Mississippi Embayment regions, extends up the Mississippi Valley as a characteristic plant of the lowlands of southeastern Missouri. Although northward in eastern Missouri it has been found locally in a number of places, these again and again are moist sandstone bluffs or banks of an acidic nature. *Hypericum petiolatum* and *Cardamine bulbosa* are additional examples of species which are common in swampy places both in southeastern Missouri and in other portions of the dispersal area, and northward in the state inhabit moist sandstones or other acidic rocks. *Lycopodium lucidulum* is an interesting example of a species which in the northern and eastern portions of its range is common in usually shaded woods. On coming southwestward into Ohio, Indiana, Illinois, Iowa, and Missouri it is found only on shaded sandstone bluffs; likewise, its variety, *Lycopodium lucidulum* var. *porophilum*, appears in similar situations.

There is yet another relationship found to exist between the occurrences of various Missouri species and the underlying rock substratum, namely, the range extensions effected by the substratum. Cases are numerous where certain types of rocks, particularly sandstones, provide in Missouri extensions of ranges for species which are rare or local, boreal or austral, or for ancient types—those with geologically ancient types of dispersal. Species of great rarity in Missouri, such as

Sullivantia renifolia, *Saxifraga pennsylvanica* var. *Forbesii*, and others, are known to occur only on St. Peter sandstone. Species of more northern affinities which extend southward into Missouri in the Ozark region on certain types of rocks are *Galium boreale* var. *hyssopifolium*, *Campanula rotundifolia*, *Zygadenus chloranthus* on limestone; *Goodyera pubescens*, *Viola pallens*, *Lycopodium complanatum* var. *flabelliforme* and *Dennstaedtia punctilobula* on La Motte sandstone; *Thelypteris palustris* var. *pubescens*, *Lycopodium lucidulum* var. *porophilum*, *Polypodium virginianum*, *Thelypteris spinulosa* and var. *intermedia*, on various sandstones and other acidic types of substrata. Of species of more southern affinities which extend northward into the Ozark region on particular rock substrata may be mentioned *Hypericum petiolatum* and *Polypodium polypodioides*. The species limited to the unglaciated southern Appalachian and Ozarkian region and therefore of particular interest as representing ancient types of dispersal are *Parnassia grandifolia*, *Trautvetteria carolinensis*, *Cheilanthes alabamensis*, *Ophioglossum Engelmanni*, *Isoëtes Butleri*, *Nemastylis acuta*, *Baptisia australis*, *Heliotropium tenellum*, *Grindelia lanceolata*, *Solidago Gattingeri* usually on limestone exposures in the Ozark region, and *Berberis canadensis*, *Asplenium Bradleyi*, *Houstonia patens* on sandstone exposures.

The examples brought out in the foregoing discussion illustrate a few of the interesting distributional relationships of various species with the substratum, and emphasize the fact that the type of underlying substratum is one of great importance in the distribution of these species in a region of residual soils such as that of the Ozark region of Missouri, and therefore becomes greatly significant in discussing the phytogeographical problems in the region concerned.

The last feature of great phytogeographic interest in Missouri to be discussed is the relative antiquity of the Ozarkian flora. Dr. Fernald[1] emphasizes this point in his introduction concerning some phytogeographic features of the eastern North American flora as follows: "Viewed from the standpoint of availability for occupation by flowering plants, the oldest large section of the region is the southern half of the Appalachian Upland, extending from central New York to northern Georgia and northern Alabama, and west of the Mississippi represented by the Ozark Plateau. Never, since it was first occupied by angiosperms, has the Appalachian Upland of the

[1] Fernald, M. L. Specific segregations and identities in some floras of eastern North America and the Old World. RHODORA 33: 25–27. 1931.

United States been invaded by seas; and, except for its northern extension, it lies wholly south of the limits of the Pleistocene glaciation. During the Cretaceous, while this southern half of the Appalachian region was covered by land-vegetation, the lower marginal country, east, south and far to the west and northwest, was submerged under the Cretaceous seas. In the Tertiary, likewise, much of the low-lying Coastal Plain was again covered by shallow seas; and, furthermore, the outer margin of the Coastal Plain is often of very modern or Quaternary origin." Map I of his article illustrates the ancient southern Appalachian-Ozarkian portion of eastern North America as one exposed since the close of the Paleozoic and available for plant occupation in eastern North America since the close of this era.

The Ozark Plateau of Missouri and Arkansas, with minor extensions into southern Illinois, southeastern Kansas, and adjacent eastern Oklahoma, has, like the southern half of the Appalachian Upland, been exposed as a land area since the close of the Paleozoic era. Like this Appalachian area, the Ozark region was uplifted at the close of the Cretaceous period, but during early Tertiary became peneplained following a long period of erosion. Over much of the Tertiary period the Ozark region was a plain of low relief covered by a luxuriant forest flora, and similar again to the peneplained southern Appalachian area this Ozark region of low relief was in Tertiary only slightly above sea-level, while the region to the south, east, and west was covered by shallow seas. At this time the great northern extension of the Gulf, known as the Mississippi Embayment, lay south and east of the Ozark area. The Mississippi Embayment became obliterated, however, towards the close of the Tertiary when another and final uplift elevated the Ozark region, which destroyed or pushed south the lowland forest that had previously occupied it. Some of this forest persists today in the lowland region of southeastern Missouri.[1] The same uplift near or towards the close of the Tertiary which hastened the extinction or migration south of much of the mesophytic flora which had covered the peneplained Ozark area, ushered in conditions making for a xerophytic or semi-xerophytic environment.

These significant geological data have a very important bearing upon the explanation of the restricted and limited ranges of a number of species in eastern North America. Both the southern Appalachian

[1] Palmer, E. J. The forest flora of the Ozark region. Jour. Arn. Arb. **2**: 229–232. 1921.

Upland and the Ozark Plateau have had somewhat similar geological history. Since the close of the Paleozoic era, each has remained an area of land standing above sea-level; each has experienced its uplifts and peneplanations, these sometimes occurring at the same geological epoch; each has witnessed its changes in flora, mesophytic types being succeeded by xerophytic ones, and vice-versa. Following the close of the Paleozoic, at times (during Mesozoic and Tertiary) when adjacent areas to the south, east, and west were flooded or submerged by continental seas, and again in the Pleistocene when areas to the north were being glaciated, the southern Appalachian-Ozarkian areas enjoyed a continuous land history. As such, both areas were able to harbour many species at times when adjacent areas were not available. Some of this flora may have had a broad dispersal from the Appalachians west to the Ozark area, but later became restricted to the southern Appalachians and the Ozark area when the flooding in adjacent areas led to exterminations. Cretaceous and Tertiary submergence of some adjacent regions, and Pleistocene glaciation of others necessarily limited the areas of distribution, and the species common to the southern Appalachian-Ozark region either have persisted there as relics or remants of an older dispersal or were forced to migrate to these land areas from other regions, or both. It appears probable that the species restricted to the southern Appalachian-Ozarkian territory, in all probability representing relics, originated in Mesozoic time, perhaps at the close of the Cretaceous period, following the uplift over the Appalachian Upland Ozark Plateau. Certainly, the species common to these two areas must have been occupying them before the Tertiary intrusion of the Mississippi Embayment, which all but broke up the territory of dispersal which formerly bridged the gap between the southern Appalachians and the Ozark Plateau. At present, only a narrow strip of the old land mass of the Ozark area remains in southern Illinois as a bridge over this otherwise enormous gap caused by the embayment.

It would appear, then, that in the southern Appalachian-Ozarkian region is to be found a center of dispersal of ancient types of species, which are as old as any in eastern North America. An investigation of the flora of this ancient area shows that there have been at least three definite centers of origin and dispersal of these old types—of relic groups of species originating or persisting on this old land mass. These centers comprise: (1) species common to both the southern

Appalachians and the Ozark Plateau and restricted thereto or also represented south and west of these two areas from which they have probably spread; (2) species restricted to the southern Appalachian area—old types which have originated in this area and are still persisting therein; and (3) species restricted to the Ozark Plateau and region southwest and west of it. Since only the first and third of these areas include Missouri species, discussion will be limited to these regions.

The list of species common to both the southern Appalachian Upland and the Ozark Plateau area include the following. It should be noted too that some of the species listed here occur somewhat south, north or west of the main area, since the original dispersal from the distributional center.

Cheilanthes alabamensis (Buckley) Kunze
Asplenium Bradleyi D. C. Eaton
Asplenium pinnatifidum Nutt.
Ophioglossum Engelmanni Prantl
Isoëtes Butleri Engelm.
Paspalum circulare Nash
Panicum xalapense HBK.
Panicum polyanthes Schultes
Aristida Curtissii (Gray) Nash
Aristida ramosissima Engelm.
Sporobolus canovirens Nash
Cyperus refractus Engelm.
Cyperus ovularis (Michx.) Torr.
Carex mesochorea Mack.
Juncus diffusissimus Buckley
Luzula campestris (L.) DC.
var. bulbosa A. Wood
Stenanthium robustum S. Wats.
Trillium viride Beck
Agave virginica L.
Iris cristata Ait.
Nemastylis acuta (Bart.) Herb.
Habenaria peramoena Gray
Salix longipes Shuttlw. var. Wardii (Bebb) Schneider
Ulmus alata Michx.
Celtis pumila Pursh
var. georgiana (Small) Sarg.
Trautvetteria carolinensis (Walt.) Vail
Magnolia acuminata L.
Berberis canadensis Mill.
Draba brachycarpa Nutt.
Leavenworthia uniflora (Michx.) Britton
Arabis virginica (L.) Trel.
Cardamine rotundifolia Michx.
Sedum pulchellum Michx.
Sedum Nevii Gray
Heuchera parviflora Bartl.
Heuchera puberula Mack. & Bush
Parnassia grandifolia DC.
Aruncus sylvester Kostel.
Gillenia stipulata (Muhl.) Trel.
Agrimonia rostellata Wallr.
Potentilla canadensis L.
var. villosissima Fernald
Baptisia australis (L.) R. Br.
Cladrastis lutea (Michx. f.) Koch
Psoralea Onobrychis Nutt.
Psoralea pedunculata (Mill.) Vail.
Robinia Pseudo-Acacia L.
Desmodium ochroleucum M. A. Curtis
Lespedeza simulata Mack. & Bush
Cotinus americana Nutt.
Rhamnus caroliniana Walt.
var. mollis Fernald
Vitis rupestris Scheele
Tilia heterophylla Vent.
var. Michauxii (Nutt.) Sarg.
Viola emarginata (Nutt.) Le Conte
Passiflora lutea L.
Eulophus americanus Nutt.
Ligusticum canadense (L.) Britton
Vaccinium arboreum Marsh.
Vaccinium neglectum (Small) Fernald
Vaccinium melanocarpum Mohr
Vincetoxicum carolinense (Jacq.) Britton
Vincetoxicum Baldwinianum (Sweet) Britton
Phacelia dubia (L.) Small
Phacelia bipinnatifida Michx.
Heliotropium tenellum (Nutt.) Torr.
Monarda Bradburiana Beck

Satureia glabella (Michx.) Briquet
Pycnanthemum albescens T. & G.
Cunila origanoides (L.) Britton
Galium virgatum Nutt.
Houstonia minima Beck
Houstonia purpurea L.
Houstonia angustifolia Michx.
Houstonia patens Ell.
Lonicera flava Sims
Viburnum rufidulum Raf.
Triosteum angustifolium L.
Lobelia leptostachys A. DC.
Eupatorium sessilifolium L.
Grindelia lanceolata Nutt.
Solidago petiolaris Ait.
Solidago Gattingeri Chapm.
Silphium Asteriscus L.
Rudbeckia fulgida Ait.
Verbesina virginica L.
Coreopsis grandiflora Hogg.
Coreopsis pubescens Ell.
Cirsium virginianum (L.) Michx.

A study of the habitats of the various species in this first category shows that over half of this flora (60 percent) grows in a xerophytic environment—barrens, dry bluffs, dry rocky hillsides, prairies, and similar exposed and semi-arid situations. The herbaceous types comprise about 80 percent of the species represented.

The other great developmental center of relatively ancient types is the Ozark Plateau and the adjacent area to the west and southwest. In some instances species originating in this area are represented slightly to the east or southeast of the main area, but have spread mostly westward and southwestward; some of this class are found as far south as the Mexican plateau or as far west as Arizona. The following list comprises species restricted to the Ozark area and the region west and southwest (some of these are known only from the Ozark region):—

Notholaena dealbata (Pursh) Kunze
Panicum obtusum HBK.
Panicum malacophyllum Nash
Sporobolus asper (Michx.) Kunth
var. pilosus (Vasey) Hitchc.
Sporobolus Drummondii (Trin.) Vasey
Carex austrina (Small) Mack.
Wolffia papulifera C. H. Thompson
Yucca arkansana Trelease
Sisyrinchium flaviflorum Bicknell
Quercus velutina Lam.
var. missouriensis Sarg.
Castanea ozarkensis Ashe
Celtis laevigata var. texana Sarg.
Geocarpon minimum Mack.
Arenaria stricta Michx.
var. texana Robinson
Talinum calycinum Engelm.
Nymphaea ozarkana Miller & Standley
Ranunculus Harveyi (Gray) Britton
Clematis versicolor Small
Clematis Fremontii Wats.
Delphinium Treleasei Bush
Delphinium Nortonianum Mack. & Bush
Corydalis crystallina Engelm.
Lesquerella gracilis (Hook.) Wats.
Lesquerella angustifolia (Nutt.) Wats.
Selenia aurea Nutt.
Sedum Nuttallianum Raf.
Saxifraga texana Buckley
Hamamelis vernalis Sarg.
Crataegus coccinioides Ashe
Crataegus lanuginosa Sarg.
Prunus hortulana Bailey
Rynchosia latifolia Nutt.
Acacia angustissima (Mill.) Ktze.
var. hirta (Nutt.) Robinson
Andrachne phyllanthoides (Nutt.) Muell. Arg.
Euphorbia zygophylloides Boiss.
Sapindus Drummondii Hook. & Arn.
Aesculus glabra Willd.
var. leucodermis Sarg.
Cissus incisa (Nutt.) Des Moulins
Callirhoë digitata Nutt.
Callirhoë Bushii Fernald
Viola Lovelliana Brain.

Oenothera missouriensis Sims
Opuntia macrorhiza Engelm.
Cynosciadium pinnatum DC.
Lomatium daucifolium (Nutt.) Coult. & Rose
Chaerophyllum texanum Coult. & Rose
Sabbatia campestris Nutt.
Centaurium texense (Griseb.) Fernald
Centaurium calycosum (Buckl.) Fernald
Onosmodium subsetosum Mack. & Bush
Scutellaria Bushii Britton
Physalis missouriensis Mack. & Bush
Amsonia illustris Woodson
Collinsia violacea Nutt.
Pentstemon Cobaea Nutt. var. purpureus Pennell
Pentstemon tubiflorus Nutt.
Pentstemon arkansanus Pennell
Aureolaria pectinata var. ozarkensis Pennell
Aureolaria calycosa (Mack. & Bush) Pennell
Ruellia pedunculata Torr.
Galium arkansanum Gray
Valerianella stenocarpa (Engelm.) Krok
Valerianella longiflora (T. & G.) Walp.
Vernonia crinita Raf.
Gutierrezia dracunculoides (DC.) Blake
Solidago radula Nutt.
Solidago Drummondii T. & G.
Solidago Lindheimeriana Scheele
Chaetopappa asteroides DC.
Boltonia latisquama Gray
Aster anomalus Engelm.
Erigeron tenuis T. & G.
Berlandiera texana DC.
Parthenium repens Eggert
Brauneria paradoxa Norton
Polypteris callosa (Nutt.) Gray
Gaillardia lutea Greene
Artemisia mexicana Willd.
Centaurea americana Nutt.
Krigia occidentalis Nutt.
Marshallia caespitosa Nutt.

An examination of this list also reveals results similar to those of the preceding, but showing more striking differences. Here about seven-eighths of the species comprising this flora grow under a xerophytic type of environment. Moreover, the herbaceous component amounts to 85 percent of the whole.

From an examination of the preceding lists it is evident that herbs comprise by far the majority of the species limited to the southern Appalachian-Ozarkian area of dispersal as well as to the Ozarkian Plateau and adjacent region. The herbaceous species which comprise the majority of the flora peculiar to the Ozark Plateau region represent at present the characteristic and dominant xerophytic flora of that region. These types seem either to have originated in the Ozark Plateau or to have spread into it on the dry uplands and barrens as a response to the xerophytic conditions occasioned by the last uplift of this region, which probably occurred either in late Tertiary or slightly later.[1], [2] Since the Cretaceous sea-bottoms underlying the Great Plains region were uplifted in early and again in late Tertiary times more or less coincident with the last Ozark diastrophism, it is likely that favorable opportunities were brought about for an incursion of the prairie flora into the Ozarks, during Tertiary times and

[1] Keyes, C. R. Age of Ozark Uplift. Mo. Geol. Surv. Ann. Rept. 7: 351–352. 1895.
[2] Keyes, C. R. Myth of the Ozark Isle. Science N. S. 7: 588–589. 1898.

vice-versa, resulting in the intermingling of the prairie and glade flora that we at present encounter. It is probable that most, if not all, of the species restricted to the southern Appalachian-Ozarkian area were in the Ozark region long before the other species of the prairies and glades which originated in the Ozark Plateau itself or spread into it from adjacent regions to the west or southwest. As has already been stated, the flora peculiar to the Ozark Plateau or to it and adjacent region west and southwest either originated in the Ozark region or spread into it when the last Tertiary uplift through that region resulted in elevated rocky glades and prairies in a drier and more semi-arid environment which favored the occupation by mostly xerophytic types of plants. Long before this uplift, however, the southern Appalachian-Ozarkian floristic element must have been dispersed before the northern intrusion of the Mississippi Embayment had all but severed its common connection. We have already seen that the southern Appalachian-Ozarkian flora probably originated sometime in the Mesozoic, perhaps following an uplift over these areas towards the close of the Cretaceous period. This latter flora, therefore, is probably the most ancient to be found in the Ozark region today. Thus, it may be concluded on the basis of the foregoing discussion that two geologically diverse floras occur in the Ozark region, (1) an ancient relic flora common to the southern Appalachians and Ozark region, and dating back in all probability to the uplift that occurred at the close of the Cretaceous, and (2) a younger flora, characteristic of the uplands and barrens of the Ozarks, a flora which probably originated in Tertiary times when this region was re-elevated in late Tertiary.

Missouri Botanical Garden, St. Louis, Missouri.

DOUBLE FLOWERS IN THE WILD SWAMP BLUEBERRY, VACCINIUM CORYMBOSUM

H. F. Bergman

(Plate 289)

Abnormal flowers in any species of *Vaccinium* are almost unknown. The only cases reported by Penzig (3) are adesmie of the corolla in *V. dialypetalum* J. J. Sm., and tetramery or occasional trimery in *V. uliginosum* L., which are minor abnormalities. Weatherby (5) has

reported dialysis of the corolla in *V. pennsylvanicum* Lam. In the summer of 1926 a single plant of *Vaccinium corymbosum* L., bearing double flowers, was found growing wild in New Jersey but too late in the season to secure good specimens. No further attempt was made to obtain flowers until 1930 when specimens were collected,[1] photographed, and an examination of the flowers made. The area in which the plant grew was later burned over, so that the plant may have been destroyed unless it grows again from the roots, which cannot at present be determined.

The flowers did not appear to be different from those of any other plant of this species unless seen at close range. The calyx and corolla were of the normal form. Stamens of the normal form were lacking but in their place was a series of corolloid whorls, each enclosing successively another (FIG. 1). The size of the whorls diminished inwardly until in the center of the flower only small scale-like structures were found (FIG. 2). Each segment of the transformed stamens forming the corolloid whorls was tipped by an imperfectly developed brown anther. Some of the anthers contained a very limited amount of highly defective, much deformed, pollen. No vestige of a pistil was observed in any of the flowers examined.

A similar stamen condition is reported by Wilson (6) in double flowers of *Epigaea*. Double flowers due to petalody and pleiomery of the stamens have been reported by W. W. Bailey (1) in *Epigaea repens*, by Masters (2) in *Erica hiemalis*, and by Rehder (4) in *Rhododendron albiflorum*. The double flowers of *Epigaea repens* described by Bailey seem to be very similar in structure to those of the blueberry here described except that Bailey found an apparently normal pistil in the flowers of *Epigaea* which was completely lacking in the specimens here described. In the double flowers described by Masters (2) the stamens and pistil were absent but in place of the latter a short shoot covered with scale-leaves was found. No statement was made by Masters as to the presence of anthers on the supernumerary corollas. With these exceptions the condition described by him in the flowers of *Erica hiemalis* corresponds very closely to that found in the blueberry flowers.

DIVISION OF FRUIT AND VEGETABLE CROPS AND DISEASES,
BUREAU OF PLANT INDUSTRY,
U. S. Dept. of Agriculture, Amherst, Mass.

[1] Grateful acknowledgement is made to Mr. R. B. Wilcox, Pemberton, N. J., for sending material for examination.

VACCINIUM CORYMBOSUM, × 2.

FIG. 1 (above). The two specimens at the left in the upper row show a normal blossom as seen externally and in longitudinal section; the specimens at the right the corresponding view of a double flower. In the bottom row, at the extreme left, is the corolla of a double flower; successive whorls of corolloid stamens are shown in order to the right.

FIG. 2 (below). Upper row left to right, the pistil of a normal flower; pistil of an abnormal flower showing absence of style and ovary; corolloid stamens; the same split lengthwise and opened out. The bottom row shows different views of normal stamens.

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2. Masters, M. T. Vegetable Teratology. London. 1869.
3. Penzig, O. Pflanzen-Teratologie. 2 Aufl. 3 Bd. Berlin. 1921–1922.
4. Rehder, A. Rhododendron albiflorum with double flowers. Bot. Gaz. 43: 281–282. 1907.
5. Weatherby, C. A. A teratological form of Vaccinium pennsylvanicum. Rhodora 29: 237–238. 1927.
6. Wilson, Kate E. Double flowers of the Epigaea repens. Bot. Gaz. 15: 19. 1890.

SMALL'S MANUAL OF THE SOUTHEASTERN FLORA.[1]—To botanists of eastern North America, Dr. Small's work needs no introduction. They have long respected it and found it indispensable; they will have a cordial welcome for this latest addition to it. A reviewer's function is sufficiently performed if he make some comparison of this Manual with the Flora which preceded it.

Certain changes are at once obvious. Although the number of pages is actually larger, thin paper has reduced the thickness of the volume by nearly one-third. The geographic area covered has been made smaller and more homogeneous by leaving out the states west of the Mississippi River. Each genus and in the case of *Carex* each section now has one clear and useful little illustration of floral parts and fruit. The longer keys have been recast into the two-story form generally used in the North American Flora—a primary key to groups of species, which are given series-names, and secondary keys to the individual species of each group. This arrangement has the advantage of bringing the main key-headings close together and, while retaining the visual clarity of the indented key, avoiding the successive steppings-back which sometimes reduce the letter-press to a narrow band at the right of the page. Many descriptions have also been skilfully and profitably rewritten,[2] and, of course, much new matter has been added from the accumulations of twenty years.

On the other hand, users of the Flora will find the general method and taxonomic point of view of the Manual wholly familiar. It affords added evidence of Dr. Small's ready hospitality to the work of others. Beside many revisions incorporated into his text, acknowledgment is made of direct aid from eighteen colleagues. Mr. Mackenzie's excellent and finely illustrated revision of *Carex* deserves especial mention here.

Familiar, too, will be the continued use of the American Code. That certain practices not now sanctioned should be kept up after the accord happily reached at the Cambridge Congress is regrettable. Apology is made for some coadjutors who are now following the International Rules

[1] Small, John Kunkel. Manual of the Southeastern Flora, being Descriptions of the Seed Plants growing naturally in Florida, Alabama, Mississippi, eastern Lousiana, Tennessee, North Carolina, South Carolina and Georgia. New York. Published by the Author. 1933. pp. xxii, 1554. Ill.

[2] In preparing our notes on the spring flora of eastern South Carolina, Mr. Griscom and I, then using the 1913 edition of the Flora, had occasion to point out some deficiences in its statements. These passages had to be deleted when the Manual appeared; it had anticipated and adequately met our criticisms.

on the ground that their contributions were already in type in 1930. The same might be said for Dr. Small's own work; the difficulties of changing nomenclatural habits in a work well under way are considerable. And in his case it could be added that this is his personal publication in which individual views can more fittingly be maintained than under the imprint of an institution. Nevertheless, it is a pity. Nomenclature is, after all, only a convention; convictions are out of place in it. The one thing worth striving for is unanimity—with common sense if possible, but, anyway, unanimity.

There is little occasion for a die-hard attitude among former partisans of the American Code. They need labor under no deep sense of defeat. If they have failed to persuade the botanical world to abandon custom altogether for a rigid priority, they have yet written into the now accepted rules much of that for which they have contended. The rules of 1930 are more like the American Code than like those under which the sixth edition of Gray's Manual and the earlier of the great floras emanating from Kew were prepared. The step to them ought not to be difficult.

The nomenclatural feature of the book hardest to regard with complacency is the unquestioning acceptance of changes in typification made under the American Code purely to satisfy its academic theory of selection of types and resulting in confusing shifts in the application of familiar names. An extreme example is *Solidago rigida*. This has been abundantly discussed by Mr. Mackenzie and me;[1] it is enough to recall that this name has been applied, ever since 1753 and with practical, if not complete, unanimity, to a certain well-marked species, represented by specimens in the herbaria of Linnaeus and of Clifford. It is now moved and made to displace another well-known and well-fixed name, simply because an individual interpretation of a dubious plate cited (unluckily) by Linnaeus is preferred to the specimens mentioned as a basis for typification. To one who holds the view of nomenclature outlined above, such abandonment of achieved definiteness for incurable indefiniteness is the *reductio ad absurdum* of the type method.

The choice of one name appears to follow no rule. *Lyonia* Ell. (1818), taken up for the more familiar *Seutera* of the *Asclepiadaceae*, is antedated by *Lyonia* Raf. Med. Repos., Hex. 2, v. 352 (1808). The latter is wholly illegitimate, being a direct substitute for *Polygonella* Michx., but it is correctly published and would seem to prevent any later use of the name, except by conservation.

The dividing up of genera proceeds, logically, a few steps farther than before. *Clintonia* and *Streptopus*, for instance, at first sight not particularly promising subjects for segregation, become two genera each; *Polygala* appears as five; *Gaylussacia* is dissolved into three; and the disintegration of *Vaccinium* is completed by the setting up of *Herpothamnus* for *V. crassifolium*. In his preface, Dr. Small disclaims any title to the appellation of "splitter"; he has, he says, endeavored "to make the genera, as far as possible, correspond in rank to the great majority of groups of species now recognized as genera by most present-day botanists." Granting that there is a tendency toward microgenera, it is still possible to doubt if a general poll of present-day botanists would really show a majority in favor of quite such finely-drawn divisions as many of Dr. Small's.

[1] Rhodora xxviii. 29–31; 138–145; xxix. 26–32.

Some newly-launched genera run at once on nomenclatural rocks. *Buxella* and *Lasiococcus* Small, of the *Vacciniaceae* are antedated respectively by *Buxella* van Tieghem (*Buxaceae*), Ann. Sci. Nat. ser. 8, v. 326 (1897) and *Lasiococca* Hook. f. (*Euphorbiaceae*) Icon. Pl. t. 1587 (1887); and *Rotantha* of the *Campanulaceae* is a later homonym of *Rotantha* Baker (*Lythraceae*), Journ. Linn. Soc. xxv. 317 (1890).

If one dislikes subgenera, he will naturally have an equal dislike for varieties; only occasionally, as in the case of the purple-flowered var. *Elliottii* of *Cirsium horridulum*, does Dr. Small give one incidental mention. As before, he gives full specific rank to any form which he finds deserving of recognition at all. One result is that, with additional material, even Prof. Burgess's far from conservative 95[1] asters are increased to 106; and *Iris*, with *I. verna* and *I. cristata* removed to another genus, is expanded from 8 to 96 species. It should be said at once, however, that this latter is no haphazard description of slightly different herbarium specimens. The remarkable iris-beds of Louisiana, from which most of the novelties came, have had prolonged study, plants have been grown at New York and seedlings watched to maturity. The interpretation, as Dr. Small rather attractively calls it, rests, then, on well-fortified conviction and treats of an unusual natural phenomenon. Even so, as one contemplates Bicknell's 36[1] *Sisyrinchia* of 1913 reduced to 12 by Mr. Alexander and Beadle's 180[1] *Crataegi* shrunk to 33 under Mr. Tidestrom's hand, one is perhaps to be pardoned for wondering what the genus *Iris* will be like in the edition of 1953.

The taxonomic outline, then, of the Manual shows, in general, close resemblance to that of the Flora, but it is to a much greater extent and to the notable and praiseworthy broadening and improvement of the work, filled in with correlative information. Much more attention is paid to phytogeography. Like other eastern botanists, Dr. Small has found that Merriam's life zones do not work well here as units of plant distribution. He takes instead Fenneman's physiographic divisions and obtains thereby clear and reasonable geographic provinces. With Dr. Wherry's aid, the divisions in which each species is found are given, so far as present information permits.[2] There are especially detailed and careful statements of habitat; soil-preference is indicated when possible. And the interest of the work is not a little enhanced by the further addition of miscellaneous notes on local uses of plants, vernacular names and the like and of critical observations drawn from Dr. Small's long and mature experience.

There may well be differences of opinion as to the limits of genera and the worth of species. No doubt there should be until our knowledge is perfect. There can be none as to the value of a work like this, the fruit of many years' labor in a field which the author has made peculiarly his own. The Manual will be for long a standard; it will always remain one of the notable American floras.—C. A. Weatherby.

[1] These figures are arrived at by deducting from the total in the Flora of 1913 those species which occur only west of the Mississippi.

[2] In a few cases, a still more detailed statement of range would have been desirable. *Leptochloa filiformis* and *Aristida oligantha* are credited to Massachusetts and *Hordeum pusillum* to Maine, as if they were native there. They are actually known in these states only as waifs in mill-waste at one or two stations separated by considerable distances from the really natural range of the species.

A CONICAL SUGAR MAPLE (TEXT FIG.).—In 1917, while spending the summer with my family at North Woodstock, New Hampshire, I was much surprised, as others have been, by a remarkable tree of *Acer saccharum* Marsh., growing in a rocky pasture on the land of George

C. Cook, Esq. I first visited the tree because, from a distance, I took it to be a White Spruce, *Picea glauca*, considerably south of its known range in New Hampshire. Upon getting near I found that the broad cone (30 feet or 9.15 m. high) was a Sugar Maple. Mr. Cook informed me that the tree was then, in 1917, approximately 70 years old, that it has never been trimmed nor browsed, that it does not flower and

that in autumn it becomes a russet-brown, without the brilliant yellow tone of ordinary sugar maples. The branches are strongly ascending and the foliage is all borne at the tips of the branchlets, so that from without the tree appears densely leafy, but close to, when viewed from below, it has an open ladder-like appearance. The tree is one of the curiosities of the region,[1] sometimes reproduced on picture post-cards, one of which Mr. Cook supplied me in 1917. In attempting to clear off accumulations of specimens from past seasons I find the material and the photograph and, since the tree seems not to have a definite name, I am calling it

ACER SACCHARUM Marsh., forma **conicum**, f. nov. (fig.). Arbor conicus ramis adscendentibus apice foliosis.—NEW HAMPSHIRE: open, rocky pasture, North Woodstock, specimens collected September 18, 1917, *M. L. Fernald*, TYPE in Gray Herbarium.—M. L. FERNALD.

A SUPPOSED HYBRID BETWEEN THE OAK SPECIES Q. RUBRA AND ILICIFOLIA

H. A. ALLARD

THE Red Oak, *Quercus rubra* L., and the Bear Oak, *Q. ilicifolia* Wang., are very common elements in the flora of the area embraced by the Shenandoah National Park in Virginia. Both species produce a dominant cover in some sections of this area, and are found on the highest peaks of the Skyline drive, namely Marys Rock, 3514 ft., Stony Man, 4010 ft., and Hawksbill, 4049 ft. On the high peaks, at least, the former sometimes appears to pass into the variety *ambigua* (Michx.) Fernald, with much deeper and more turbinate cups. Specimens of this type may be found on the Hawksbill near its highest point. In the same vicinity and elsewhere individuals occur producing the flat saucer-shaped cup of typical *rubra*. Both the Red Oak and the dwarf Bear Oak grow in close proximity in many localities, even on the highest peaks.

On September 23, 1933 the writer found on Little Stony Man several dwarf specimens of an oak bearing all the ear-marks of a hybrid involving *rubra* and *ilicifolia* parentage. The shrubs had the low scraggy growth of *ilicifolia* and were fruiting heavily. The

[1] On May 25, 1934, passing through North Woodstock with a class of students, we noted the roadside sign "THE MYSTERY TREE" pointing to the conspicuous tree which looked vigorous and as perfect in form as in 1917.

leaves, of the general shape of *ilicifolia* but larger and with more bristle points on the lobes, are nearly smooth and green beneath as in *rubra*, not having the close persistent white-downy pubescence of *ilicifolia*. The twigs, likewise, are smooth and reddish in color as in the case of *rubra*. The fruit is somewhat larger than that of *ilicifolia*, with the shallow flat cup of *rubra*. The acorn is more of the shape of *rubra*, but with the light and dark longitudinal stripes or bands often present on typical *ilicifolia* acorns. Large quantities of acorns were secured from these dwarf individuals, and planted to observe the genetic behavior of this interesting form. Specimens have been placed in the United States National Herbarium.

A number of supposed hybrids between the Bear Oak and other species of the Black Oak group have been recognized, involving crosses with *velutina* (× *Q. Rehderi* Trel.); with *phellos* (× *Q. Giffordi* Trel); with *marilandica* (× *Q. Brittonii* Davis); with *coccinea* (× *Q. Robbinsii* Trel.); with *rubra* var. *ambigua* (× *Q. Lowellii* Sarg.), the latter having been found at Seabury, York Co., Maine.

BUREAU OF PLANT INDUSTRY,
Washington, D. C.

WOLFFIA IN MASSACHUSETTS.—Last August, while collecting specimens of *Zizania* in a small marsh near Northampton, I noticed a green coating on the surface of the water which was apparently due to some member of the *Lemnaceae*. This proved to be almost a pure colony of *Wolffia columbiana*. The marsh is located in the Northampton-Easthampton meadows (Mt. Tom Station) along a small tributary of the Connecticut river oxbow; although the plant may be present in the oxbow itself, I have not seen it there. *Wolffia* has been reported from several places in Connecticut and from Lake Champlain, but this seems to be the first record of the genus in Massachusetts. It may have been very easily overlooked in other localities.—WAYNE E. MANNING, Smith College.

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CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY—NO. CV.

DRABA IN TEMPERATE NORTHEASTERN AMERICA

M. L. Fernald

(Plates 290–319)

Introduction

In the northeastern United States the genus *Draba* is only slightly developed and without taxonomic difficulty; but northeastward, on the Gaspé Peninsula, in western Newfoundland and on the Labrador Peninsula, the genus begins to show some of the diversities and complexities which, in cordilleran North America, Europe, boreal and alpine Asia and the Arctic, render its satisfactory classification most difficult. The recent studies of types of arctic American species by Mrs. Elisabeth Ekman,[1] the studies of Asiatic species by Pohle[2] and the ostensibly world-wide (but chiefly Eurasian) monograph of *Draba* by O. E. Schulz[3] have made it opportune, or at least desirable, to attempt to set our own Drabas in order. For her very painstaking

[1] Elisabeth Ekman: *Nomenclature of some North-European Drabae*, Arkiv. f. Bot, xii. no. 7: 1–17, t. 1 (Nov., 1912); *Hvad är Draba hirta L.?*, Bot. Notiser (1913), 183–192 (1913); *Zur Kenntnis der Nordischen Hochgebirgs-Drabae*, Kgl. Svenska Vet.-Akad. Handl. lvii. no. 3: 1–68, tt. 1–3 (1917), ser. 3, ii. no. 7: 1–56, tt. 1–3 (1926); *Studies in the Genus Draba*, Svensk. Bot. Tidskrift, xxiii. 476–495 (1929); *Contribution to the Draba Flora of Greenland*. II, ibid, xxiv. 280–297, t. iii (1930); *Contribution*, etc. III, ibid, xxv. 465–495, t. v (1931); *Contribution*, etc. IV, ibid, xxvi. 431–447 (1932); *Contribution*, etc. V, ibid, xxvii. 97–103 (1933); *Contribution*, etc. VI, ibid, xxvii. 339–346 (1933).

[2] R. Pohle, *Drabae asiaticae*, Fedde, Repert. Beiheft, xxxii. 1–225 (1925).

[3] O. E. Schulz in Engler, Pflanzenr. iv[105] (1927).

search for the historic type-specimens of the Greenland and other arctic species and for her critical discussions of them we owe gratitude to Mrs. Ekman, who has been able to clarify many formerly obscure situations.

The inherent difficulty of the group, however, coupled, it would seem, with lack of clarity in definition, is peculiarly emphasized by Schulz's treatment. To use his keys, whether to the sections or within the sections, with possibility of arriving at even a doubtfully satisfactory identification, one needs to have had much experience in following down false leads and in successively trying another and another, until eventually some sort of "identification" is achieved. Such misleading and carelessly constructed keys are altogether too familiar in the work of certain Americans; they are not at all confined to European taxonomy, although the sum-total of inadequate and discouraging keys in *Das Pflanzenreich* is disproportionately large. A few illustrations, taken chiefly from species of our eastern American flora, will clearly bring out the inadequacy of these keys.

In the Shickshock Mountains of Gaspé there occurs a densely humifuse and matted, glabrous plant (PLATE 292)[1] with naked, filiform scapes a few centimeters high, which has erroneously passed as *Draba fladnizensis* Wulfen or as the closely related *D. lactea* Adams or *D. fladnizensis*, var. *heterotricha* (Lindbl.) Ball (PLATE 291). The plant is one of four scapose species found (thus far) about the Gulf of St. Lawrence, the others being the well-known stellate-pubescent *D. nivalis* Liljeblad (PLATE 295, FIGS. 1–3), another but apparently undescribed species (PLATE 295, FIGS. 4–7) also with stellate pubescence, as yet known only from a single collection, and the strongly hispid *D. rupestris* R. Br. (PLATE 293), likewise known near the Gulf of St. Lawrence from a single station only. In the present connection the important point to note is, that these plants are normally scapose, only very exceptionally with 1 or 2 small bracteal leaves, the filiform scapes usually only 1–10 cm. high. Consequently, a botanist without uncanny intuition or without special forewarning would inevitably look for them all under the 1st main division of the genus in Schulz's treatment.

A. Caules floriferi aphylli, scapiformes.

But, alas, not one of them, nor the species to which Schulz refers them, is treated by him in the scapiform group! On the contrary, all

[1] This paper being originally published in parts, the plates may not occur in the installments where occasionally cited.

four of the species to which these tiny scapose plants have been referred are found extensively treated under

B. Caules floriferi ± foliosi.

This is the more disconcerting since the monographer correctly describes *D. nivalis* with "Caules filiformes, . . . aphylli vel monophylli," *D. rupestris* with "Caules tenuissimi, aphylli vel monophylli" and *D. fladnizensis* with "Caules . . . aphylli vel sub flore imo folio unico praediti"; and in his fig. 28,J he shows the latter with 5 entirely naked scapes and 2 with a bract subtending the lower pedicel; while in his fig. 25,H he correctly illustrates *D. lactea* with absolutely leafless scapes. The only species of our area (in northern Labrador) admitted by Schulz to his "**A.** Caules floriferi aphylli, scapiformes" is *D. alpina* L. (PLATE 290); but its very remote segregation in the key from the others is not made clear by the essentially identical descriptive phrase, in the specific treatment, "Caules . . . plerumque aphylli, rarius monophylli." The fundamental trouble, of course, is the altogether too common one of trying to build mutually exclusive keys upon a single inconstant character, without giving warning of exceptions, as a careful systematist would endeavor to do. This reliance upon single inconstant characters is found, also, in the keys to species within the artificially separated sections.

One other illustration, this based on undoubted members of group "**B**," is illuminating. One of the comparatively frequent species of easternmost Quebec, Newfoundland and Labrador is the biennial *D. incana* L. (PLATE 299), often with excessively leafy flowering stem, the crowded leaves up to 95 in number: "foliis numerosis (usque ad 50 vel etiam ad 95 . . .) valde approximatis"—Schulz, l. c. 285. One would, therefore, promptly key it (Schulz, l. c. 19) to

I. Caules foliis multis densifolii . . . Sec. XII. **Phyllodraba,**

a section in which Schulz places our *D. aurea* M. Vahl (PLATE 296), with "Caules . . . crebre (8–16-) foliati" (which is not a very large number) but, also, the Japanese *D. Sakuraii* Makino with "Caules . . . 3–6-phylli," the Colorado *D. crassa* Rydb. (*D. chrysantha* Wats., 1882, not C. Koch, 1847) with "Caules floriferi . . . paucifolii" (the specimens have 1–5 leaves), the Californian *D. corrugata* Wats., well illustrated by Schulz, his fig. 23, showing the few leaves of the primary axis (as in Watson's type) 0.5–1 cm. or more apart (not well described by Schulz's sectional "Caules foliis multis densifolii") and, finally, the New Mexican *D. mogollonica*

Greene, with "Folia . . . caulina . . . pauca (1–3), remota"!! But, *D. incana* "foliis numerosis (usque ad 50 vel etiam ad 95 . . .) valde approximatis" is not placed by Schulz in § *Phyllodraba*. Instead, it is exhaustively treated and over-divided in § XIV. **Leucodraba**, under the call

II. Caules foliis paucis remotis paucifolii.

The preceding instances illustrate the difficulty of interpreting correctly Schulz's sectional groupings of *Draba*, at least those represented in North America. Similar difficulties, most unfortunately, are met in coordinating the specific diagnoses with the key-characters given by him. For example, in sect. *Leucodraba* the key to subsect. *Holarges* (pp. 204–206) is of vast importance to students of the boreal floras. The first division is

a. Siliculae ellipsoideae,

as opposed to

b. Siliculae oblongae vel lineares.

Nevertheless, species covered in the key only under "a. Siliculae ellipsoideae" (nec "oblongae vel lineares") are further defined as follows: *D. hirta*, "Siliculae ex ovato lanceolatae" (p. 204); *D. subamplexicaulis*, "Siliculae . . . . oblongae" (p. 273); *D. daurica*, "Siliculae . . . oblongae" (p. 274); *D. arabisans*, "Siliculae . . . lineari-lanceolatae, semper acuminatae" (p. 275); *D. Henneana*, "Siliculae . . . oblongae vel ex ovato oblongae" (p. 276); *D. mongolica*, "Siliculae . . . ovoideae vel anguste lanceolatae, acutae" (p. 278); *D. sachalinensis*, "Siliculae ovato-lanceolatae, . . . ad apicem in stylum . . . attenuatae" (p. 281); *D. incana*, "Siliculae . . . lanceolatae vel oblongae" (p. 283): etc. The inclusion in the key of numerous species as having siliques ellipsoid, as opposed to oblong or linear, and then the further definitions of them as having the siliques oblong, ovoid, lanceolate or linear-lanceolate and acuminate or attenuate (surely not ellipsoid) is such evident contradiction and leads to such inevitable perplexity that one wonders if the many European admirers of Schulz's work have actually faced the problem of using his keys. Schulz's descriptions of species and his bibliography are of remarkably high quality; it is, therefore, the more to be regretted that his keys are so misleading. To some of us, who have long worked in taxonomy, the test of monographic work is the accurate construction of the keys; unless the keys unlock the doors it is impossible to enter.

This extreme difficulty or impossibility of arriving surely at a correct identification by trying to follow the keys in Schulz's monograph is not the only reason for my boldness in attempting to work out some sort of recognizable classification of our Drabas. The group is a most interesting element in the more localized or isolated floras of northeastern America and its geographic as well as taxonomic relationships are important to understand. Furthermore, the full content of the *Draba* flora of the temperate latitides of eastern North America has been most inadequately appreciated. The greatest development of the genus in America is, of course, in the cordilleran region, with the Arctic next; but in the area covered by Gray's *Manual*, thence east to Newfoundland and north across the Labrador Peninsula or south into Georgia, we now know at least 25 true species, and several more are doubtless present.

The utter inadequacy of treatments of *Draba* for the area just defined becomes emphasized when it is noted that in Schulz's monograph ONLY 135 SPECIMENS in the entire genus are cited from the area above defined, and those are largely of the well known annual and biennial species of the South (*D. caroliniana* Walt., *D. cuneifolia* Nutt., *D. brachycarpa* Nutt., etc.). However, in the Gray Herbarium alone (to say nothing of the Canadian National Herbarium, the herbarium of the University of Montreal, the United States National Herbarium, and numerous other large herbaria in the Eastern States, which would more than double the number) the single species, *D. arabisans* Michx., is represented by 154 sheets; while *D. glabella* Pursh (*D. hirta* of most eastern American authors, including *D. Henneana* of Schulz's treatment and *D. daurica* of Mrs. Ekman's) has 137 sheets.

For all of North America (excluding Greenland) Schulz cites only a single atypical (and apparently not conspecific) number (PLATE 303, FIG. 1) from the Gaspé Peninsula to represent *D. norvegica* Gunner (PLATE 301); yet the Gray Herbarium alone exhibits 87 sheets or numbers of *D. norvegica* from Newfoundland and Quebec Labrador! Again, *D. rupestris* R. Br. (PLATE 293) is recognized by Schulz only from Scotland and the Faeröes. Nevertheless, had he done what a monographer of a world-wide genus should be expected to do, namely, visited the larger American herbaria before writing with quasi authority on American plants, the author would have found at the easternmost of the great herbaria (the Gray Herbarium) plants from Newfoundland (PLATE 293, FIG. 2) and Labrador (FIG. 3) which seem quite

inseparable from authentic specimens (FIG. 1) from the type-locality of *D. rupestris*, Ben Lawers in Scotland, except that they are sturdier.

Unfortunately, one can hardly feel that the treatment of *Draba* in *Das Pflanzenreich* shows any more understanding of American plants than has been indicated for other groups by writers of certain treatments in some other volumes in the series. The prevalent European assumption that American plants can be adequately known and understood without visiting and studying the large American herbaria, where the bulk of American specimens are, naturally, preserved and where European visitors would be most cordially welcomed, is one of the greatest fallicies of much Old World taxonomic publication, ostensibly of world-wide scope. It is, I realize, a thankless and unappreciated, if not quite useless task for a mere American to point out weaknesses in the work of some European taxonomists (and other botanists);[1] but, surely, the publications in Europe on American groups would be less open to just criticism if their sponsors would see to it that only the most scholarly work, based upon a truly adequate understanding of the plants and upon ability clearly to present the results, were published. It requires a degree of assurance, which most of us lack, and an opportunity to study extensively in the greater herbaria all over the world, an opportunity which comes to few, properly to prepare the specialist for a monograph of world-wide scope. Such a fortuitous combination of requirements is not common and, perhaps, has never been achieved, but it is certainly not too much to expect that those who undertake cosmopolitan monographs should make some effort to meet these elementary requirements.

Some years prior to the World War, the author of one of the voluminous German monographs (of a genus with 400–500 species in North America) wished, what was obviously out of the question (as wholly crippling work at the lending institution), to borrow many thousands of irreplaceable sheets (including all types) of his assigned group from the Gray Herbarium. Being then a bachelor, with a

[1] The late Charles Baron Clarke, F.R.S., F.L.S., one of the most prolific writers on the *Cyperaceae*, once wrote: "All papers, at least of a systematic kind, prepared in Asia, Africa, or America, must be, as literary work [he omitted to say "as systematic work"], very poor performances in the eyes of botanists in the herbaria of London, Paris, and Geneva [for some reason omitting Berlin]."—C. B. Clarke, Journ. Linn. Soc. Bot. xxi. 2 (1884). To one who has some familiarity with *Carex* in North America it is appalling to see how thoroughly the more technical groups of American *Carex* (like the *Ovales*) were misidentified and with what notes of assurance they were mislabelled by Clarke in the herbarium at Kew.

larger proctorial suite of rooms than I needed, I invited my German colleague to spend two or three months in Cambridge as my personal guest. His reply intimated a reason which, unfortunately, limits the possibilities of broad outlook everywhere: "Mit besten Dank bescheinige ich Ihren den Empfang Ihres Briefes. . . . Lebhaft bedauere ich *vorerst* nich persönlich Ihre Bekanntschaft in Cambridge machen zu koennen, wir haben in Deutschland Geld für alles, nur nicht für die Wissenschaft."

Even the best of European taxonomic work on groups largely American, conscientiously done by a master of the group, loses much of its implied completeness and authority when, owing to neglect of all except a few continental herbaria, its author fails to study many thousands of American specimens which would clarify his understanding and make his work more truly cosmopolitan. Thus, in Niedenzu's potentially great monograph of the largely American family (seven-eighths American) *Malpighiaceae* there is, as Gleason has already clearly pointed out, "extraordinary and astounding neglect of American material." As Gleason, further, quite justly says, "a visit to America is certainly not too much to expect of the author of a volume for such a dignified and ostensibly authoritative work as the Pflanzenreich. . . . . Finally, it seems that the present author would be informed and all future authors in the Pflanzenreich warned that there are two large herbaria in London and several large herbaria in the Americas, all of which contain much material of importance in the monographing of any group of plants."[1] Dozens (on the average) of American taxonomists annually visit the larger herbaria of Europe for study of types and authentic material. The European taxonomist, one would suppose, would find it absolutely essential to visit the greater American herbaria, if he expects adequately to understand American plants or if he hopes to have his outputtings on American groups respected by American botanists

[1] Gleason, Review of Niedenzu's *Malpighiaceae*, Torreya, xxx. 101–103 (1930).

The very natural and human but unfortunate tendency to attempt world-monographs from a wholly provincial viewpoint is not new. The pantropical genus *Smilax* has great development in southeastern Asia (including French Indo-China) and in eastern America. In view of the amazingly important and voluminous collections from these areas accumulated at the Muséum d'Histoire Naturelle in Paris (and elsewhere), the following passage, written in Geneva in 1878, by Alphonse and Casimir DeCandolle is significant: "Les Smilacées ont été l'object de deux très-bons travaux, . . . Kunth, dans le cinquième volume de son *Enumeratio*, publié en 1850, a décrit très-soigneusement les espèces, du moins celles qu'il voyait dans son herbier, dans celui de Luca ou dans l'herbier royal de Berlin, car il ne mentionne aucune des autres grandes collections, pas même celles de Paris où il a résidé si longtemps."—A. & C. DC., Mon. Phan. i. 2 (1878).

as satisfactory world-treatments. By crossing the Atlantic and making use[1] of our important herbaria he would, also, give us an opportunity to reciprocate the many courtesies and attentions we so regularly receive when we visit the Old World botanical centers.

Greater intercourse between the taxonomists of the Old World and the New would do much further to remove or to modify the once disdainful attitude toward American herbaria and botanical publication and the once frequent assumption of finality of botanical knowledge and of its monoply in limited areas, above referred to. With a less restricted conception of the physiographic, consequently botanical, diversity of regions outside Eurasia the following incident of a not very distant past would hardly recur. A sumptuous Old World monograph of a large boreal genus recognizes but 2 species in Newfoundland, each represented by a single specimen seen. We now know 9 species in that country, represented by nearly 100 numbers in the Gray Herbarium alone. Twenty years after the publication of the monograph I wrote its author, offering to send material of additional species. The reply was: "Ich fürchte dass ich nicht 6–8 Arten aus Newfoundland werde anerkennen können. Ich habe bis heute, obwohl ich viel neues Material in der Hand hatte, keinen Grund gefunden, von dem in meiner Monographie angenommenen Artenumfang abzugehen." If the perfectly frank author here quoted had seen the larger American herbaria, his outlook would have been quite different; at least, he would have had the opportunity for new light.

After openly regretting the weaknesses in the work on American species of the most prolific writer on the *Cruciferae*, it is perhaps unseemly to venture a paper on so difficult a group as *Draba*. It is, however, with full realization of the difficulties but with the hope of at least somewhat clarifying our understanding of our own plants that the present synopsis is presented; only by painstakingly working out the species in natural areas can we attain the proper bases for world-monographs. The lines drawn between species, for instance between *D. rupestris* (PLATE 293) and *D. norvegica* (PLATES 301, 302), when fuller experience justifies, may have to be modified or abolished. In a group where morphological characters of flower and seed are almost wanting and where habit and character of pubescence are more than usually depended upon that is inevitable.

[1] I do not mean to imply that the bulk of specimens in American herbaria can be divided and shared, as one European visitor has repeatedly requested.

The names, likewise, may eventually need some alteration. Without the most intensive understanding of the plants and the most intelligent comparison of adequate series of specimens with the type-specimens, when they can be located, there is constant danger of going astray. In many cases I have been forced, at least for the present, to accept the verdicts of others, especially Mrs. Ekman, Pohle and Schulz, regarding such identities. As pointed out, however, in the discussion of *D. glabella* (PLATES 307–312) Mrs. Ekman recently (1917) asserted with some confidence that the boreal plant which has oftenest (but erroneously) passed as *D. hirta* L. is not that Linnean species, but is a series of boreal subspecies and varieties of the Patagonian *D. magellanica* Lam.; the plants with pubescent siliques being *D. magellanica*, subsp. *cinerea* (Adams) Elis. Ekm. with its var. *dovrensis* (Fries) Elis. Ekm.; those with glabrous siliques *D. magellanica*, subsp. *borea* Elis. Ekm. Very soon, however, she withdrew two of the boreal plants from the Patagonian, her *D. magellanica*, subsp. *cinera* again (and rightly, it seems to me) becoming (1929) *D. cinera* Adams (1817) and her *D. magellanica*, subsp. *borea* identified (1930), correctly, with *D. daurica* DC. (1821); but *D. magellanica*, var. *dovrensis* was left unchanged, except that Mrs. Ekman finally considered it a hybrid of *D. daurica* and *D. cinerea*, an origin hardly probable for the true Patagonian *D. magellanica*. Through the generosity of my former student. Mr. J. Francis Macbride, I have a photograph and detailed account of the type of *D. daurica* DC. (1821), PLATE 308, FIG. 3. Through the great kindness of Prof. J. Milbraed, Curator of the Botanical Museum at Berlin-Dahlem, the actual type (PLATE 308, FIG. 2) of *D. Henneana* Schlechtendal (1836) is before me. Through Mrs. Ekman and Dr. Porsild I have many sheets identified by Mrs. Ekman as *D. daurica* (1821) and as *D. magellanica*, var. *borea* (1917). So far as I can make out they are conspecific; but a still earlier name has been overlooked. *D. glabella* Pursh (1814), with an unfortunately misleading name for a plant with stellate pubescence on rosette-leaves, stem, cauline-leaves and sometimes the siliques!, was based on a specimen in the Banks Herbarium, from Hudson Bay. The excellent photograph (PLATE 308, FIG. 1) of it kindly supplied by Mr. Ramsbottom, Keeper of Botany in the British Museum, with detailed notes on all technical characters by his associate, Mr. Exell, leaves no question that *D. glabella* (1814) is conspecific with the others and antedates them all, except *D. magellanica* Lam. (1786), with which I am not convinced that the boreal plants are conspecific.

I have, unhappily, been obliged to point out the inadequacy of certain European work upon the American species of *Draba* and some other groups. Another disconcerting tendency, especially of some Swedish students, is to see hybrids in every plant they do not promptly understand. Floderus, following this wholly hypothetical and very dubious course, has treated nearly all Greenland *Salices* as hybrids. Few representatives of species are found, according to him, in Greenland. It is, consequently, astounding that so many of the Greenland specimens of *Salix* should be inseparable from common plants of the coast of Labrador, northwestern Newfoundland and Gaspé, where at least one of the hypothetical parents assigned by Floderus for the Greenland plants does not occur. Along the same line, Mrs. Ekman has marked a large proportion of the specimens, which she did not understand, in the National Herbarium of Canada as hybrids or probable hybrids of far-distant parents.

As an illustration of this easy but specious method of solving the identity of a plant I may cite no. 1920 of the Canadian National Herbarium, originally distributed as *Draba aurea* M. Vahl, from sand and gravel, Little Charlton Island, James Bay, July 14, 1887, *J. M. Macoun*. The three plants on the sheet at Ottawa are passing from flower to fruit, showing the short and thick, strictly terminal racemes, the long soft pilosity of the 20 ± crowded cauline leaves and the stems, the characteristic retrorse villosity of the silique, the long style (1 mm. long) and the golden petals which at once characterize *D. minganensis* (Victorin) Fernald (PLATES 297, 298), a species with three areas of extreme localization: the Mingan Islands, north of Anticosti; cliffs of Bic, Rimouski Co., Quebec; and limestone islands of James Bay. Yet Mrs. Ekman, not knowing Canadian Drabas from field-experience, labels the Little Charlton Island plant "*Draba aurea* M. Vahl, f., potius hybrida: *D. aurea* × *daurica* (an = *D. arabisans* Michx.)."

The white-flowered *Draba daurica* (i.e. *D. glabella*), with closely pannose-stellate pubescence on leaves and stems and with only 1–5 cauline leaves, and glabrous to sparsely stellate-hirtellous siliques with styles barely 0.5 mm. long (see PLATE 307), occurs in all the areas of *D. minganensis* but its relationship to that species is merely geographic. *D. arabisans* (PLATES 314, 315) is an endemic of eastern North America, with the pubescence of basal foliage and stem minutely stellate-pannose, the 3–12 cauline leaves scattered, the siliques glabrous and the petals white. It has no close relationship to *D.*

minganensis nor has it ever been found either on the Mingan Islands or about James Bay, where it should be expected if it has there produced stable and fully fertile offspring. As for *D. aurea*, that very characteristic species of the North (PLATE 296), is the only one of the three hypothetical parents of Mrs. Ekman's supposed hybrid which is related to *D. minganensis*. It is at once distinguished, however, by the slender and very elongate, leafy-bracted raceme. Furthermore, it is quite unknown about the Gulf of St. Lawrence and, consequently, can hardly have helped give rise to the Mingan and Bic colonies of the very characteristic *D. minganensis*.

Just as this is going to press another of Mrs. Ekman's interpretations of an endemic American species comes to hand. Lest to those who do not know the plants concerned or American geography or who do not check the statements of fact it may seem that I am overstressing the absurdities which the hybridophile will fail to see, I am here quoting Mrs. Ekman's complete statement.

Draba arabisans Michx.

In the year 1911, on my first visit to the Copenhagen Herbarium, the late Professor OSTENFELD had the kindness to show me a specimen of *D. arabisans* Michx. which had been obtained from MICHAUX' countryman, DESFONTAINES, and might possibly be regarded as a second-type. It was not until 1927 that I had an opportunity to see and examine MICHAUX' type in the Musée du Jardin des Plantes in Paris. I then found, that the type-specimen in every respect agreed with DESFONTAINES's plant and that the two plants probably had once belonged to the same tuft. The stalks of MICHAUX' own type were perhaps a little taller, at least one of them, which was somewhat branched at the top.

When examining the specimens of *D. aurea* in the Copenhagen Herb., in 1931, I was struck by the correspondence which I found to exist between certain of the aforesaid hybridous forms of *D. aurea* and the specimen of *D. arabisans* Michx. donated by DESFONTAINES. Through a microscopical examination of the latter I have been convinced of the identity of this form with the hybrid of *D. aurea* × *daurica*. To the naked eye the fruits of *D. arabisans* looked glabrous, but under the microscope a few hairs were found in the margin of the valves of some of them. The cruciate hairs on the leaves of *D. arabisans* are shorter and more branched than those of *D. aurea*. The style is shorter than that of *D. aurea* but longer than that of *D. daurica*, the pedicels longer and more spreading than in the latter species and the raceme consequently broader; the pods are slightly twisted. The cauline leaves are of an intermediate number, viz. 6–7 on each stalk, and the stalks are bare between the upper cauline leaf and the lowest pedicel. . . .

MICHAUX' diagnosis is very incomplete, but one characteristic deserves to be remembered, viz. the pointed styles. This may mean that the pods are pointed at the apex; a characteristic which agrees with the pods of both *D. arabisans* and *D. aurea*. *D. arabisans* was collected by MICHAUX

in the Hudson Bay area ("Hudson Strait") and there both *D. aurea* and *D. daurica* are to be found. It is a pity that no distinct proof can be given of the hybridogenity of *D. arabisans*. One has only to study all intermediate forms between *D. aurea* and *D. daurica*, and among them there will probably be found some that agree with the type of *D. arabisans*. Some forms, labelled *D. arabisans* by American botanists, resemble closely *D. daurica*, and are possibly derived from a second crossing, viz. between *D. arabisans* and *D. daurica*. In the specimens found by Messrs A. E. & R. T. PORSILD in 1928 at the Great Bear Lake, the characteristics from *D. aurea* were, however, present, though latent and not obvious.

And finally I only wish to propound: E. GREENE described *D. praealta* with white flowers in Pittonia III (1898), p. 306. In the Manual of Botany of Centr. Rocky Mountains by J. M. COULTER and AVEN NELSON (1909), p. 222 *D. lapilutea* (which according to RYDBERG and SCHULZ is the same plant) is described with yellow flowers. Is this plant possibly also a form of the hybrid of *D. aurea* × *daurica*, of which *D. arabisans* seems to be one? *D. praealta* has been regarded as an annual or biennial plant, but some specimens in the herbaria, for instance no. 22875 in the National Herbarium of Ottawa, which was collected by J. W. BELL in 1900, are obviously perennials.[1]

It is most distasteful to be unable always to agree with others; it is most unfortunate that some whom we should like to accept as authoritative students fail to check their own statements and so easily reach important decisions with inadequate understanding of the plants they discuss. Michaux's complete discussion of *Draba arabisans* was as follows:

> ARABISANS. D. caule folioso, simplici vel rarius ramoso: foliis radicalibus cuneato-lanceolatis; caulinis lanceolatis; omnibus acutis: siliculis stylo acuminatis.
>
> *Obs.* Affinis *D. incanae;* minus ramosa; racemo fructifero minus elongato: siliculis longioribus: foliis caulinis dissitis.
>
> *Hab.* in rupibus ripariis ad lacum *Champlain* et in Nova Anglia.

Nevertheless, in a paper on GREENLAND Drabas, Mrs. Ekman states, without a word of qualification, that "*D. arabisans* was collected by Michaux in the Hudson Bay area ('Hudson Strait')." A glance at Michaux's own statement is sufficient to show the complete inaccuracy of this assertion. Lake Champlain, about 125 miles (200 km.) long, separates the states of Vermont and New York, extending slightly into southernmost Quebec. It has an altitude of 96 feet (29.4 m.) and a flora of Alleghenian type, slightly verging on warm-Canadian. Its northernmost shore is MORE THAN 1100 MILES (1770 KM.) SOUTH OF THE NEAREST POINT OF HUDSON STRAIT. Michaux's routes are perfectly well known;[2] the nearest he ever got to

[1] Elis. Ekman, *Contribution to the Draba Flora of Greenland, VII: Draba arabisans Michx.*, Svensk Bot. Tidskr. xxviii. 79–81 (1934).

[2] See Journal of André Michaux. 1787–1796, with an Introduction and Notes by Charles Sprague Sargent. Proc. Am. Phil. Soc. xxvi. no. 129 (1889).

Hudson Strait (except possibly in crossing the ocean) was the northern bend of Rupert River, 700 miles (1125 km.) to the south.

Mrs. Ekman's misstatement of the source of the type of *Draba arabisans* and her mistranslation of the very simple diagnostic phrase, "siliculis stylo acuminatis" as "the pointed styles" ("MICHAUX' diagnosis is very complete, but one characteristic deserves to be remembered, viz. the pointed styles") seriously shake a faith which, I had hoped, could be placed in her precision; and her confidence, from study of a single fragmentary specimen, that *D. arabisans* is a hybrid of *D. aurea* and *D. glabella* (*D. daurica*) as seriously disturbs my high estimate of her scientific judgment.

Briefly summarized, the chief diagnostic characters and the geographic ranges of the three plants under discussion are as follows:

D. AUREA: Short-lived perennial (sometimes biennial?), with few basal rosettes; stems simple or rarely forking, very leafy, densely stellate-pubescent and pilose; rosette-leaves canescent-pilose; cauline leaves 7–25, oblong- or ovate-lanceolate, with broad sessile bases, pilose; racemes mostly 10–60-flowered, with the lower 4–12 flowers leafy-bracted, in maturity elongating to ½–⅘ the total height of the plant; sepals pilose; petals golden-yellow; siliques 0.7–2 cm. long, densely pilose, with style 0.5–1.8 mm. long; seeds 30–50, about 1 mm. long. Greenland; northern Labrador; southwestern Ungava (no specimens seen from Hudson Strait); Black Hills and Rocky Mts. See PLATE 296 and MAP 8.

D. GLABELLA, var. TYPICA (D. DAURICA): Suffruticose long-lived perennial, forming extensive mats of rosettes; stems simple or sparsely branched, remotely leafy, minutely stellate-pannose; rosette-leaves minutely stellate-pannose; cauline leaves 0–5, mostly rounded at base, stellate-pilose or glabrate; racemes strictly terminal, long-peduncled, mostly 5–15-flowered and rarely, if ever, elongating to 1/2 the height of the plant; sepals pilose to glabrous; petals white; siliques glabrous or hirtellous, conspicuously veiny or rugose, 6–13 mm. long, with thick style obsolete or up to 0.5 mm. long; seeds 18–36, 0.7–1 mm. long. Arctic and subarctic regions, south to Newfoundland, Quebec, Lake Champlain (a single known station), New York, and shores of Hudson Bay. See PLATES 307 and 308, and MAP 17.

D. ARABISANS. Suffruticose long-lived perennial, forming extensive mats of rosettes; stems mostly branching, remotely few-leaved, glabrous or sparingly stellate-pannose; rosette-leaves minutely stellate-pannose or glabrate; cauline leaves 3–12, cuneate or but slightly rounded at base, glabrous or stellate-pannose; racemes strictly terminal, long-peduncled, the primary ones 7–25-flowered, in fruit ⅕–⅓ the height of the plant; sepals glabrous or sparsely hirtellous; petals white; siliques glabrous, lustrous and scarcely veiny, 5–15 mm. long, with slender style 0.5–1 mm. long; seeds 12–36, 1.1–1.7 mm. long. St. Lawrence basin and adjacent northern New England, Newfoundland to the Great Lakes. See PLATES 314 and 315 and MAP 21.

Draba arabisans, familiar to every botanist who knows its type-region, ledges about Lake Champlain, and the dry slates, schists and

limestones of most of the St. Lawrence basin, has so few traits of the arctic and subarctic *D. aurea* that it is almost unbelievable that any one should have imagined that it has any relationship to that short-lived golden-flowered plant, with leafy-bracted, very elongate racemes, numerous pilose leaves, pilose, mostly simple stems and pilose many-seeded siliques. Is it not apparent, if *D. aurea* ever were, by the most improbable long-distance transfer of pollen, a parent of *D. arabisans*, that something of the habit, pubescence, leafiness and color of flower ought to crop out in the "hybrid"? If such a far-fetched explanation were defensible, should not *D. arabisans* show something of the broad-based cauline leaves of *D. aurea* and of *D. glabella;* should it not occasionally have more ovules and seeds (the maximum number in *D. arabisans* and in *D. glabella* or *D. daurica* being near the minimum in *D. aurea*), and if *D. aurea*, with seeds 1 mm. long, should fortuitously cross with *D. glabella* with even smaller seeds (0.7–1 mm. long), why should their "hybrid" have the seeds consistently larger than in either (1.1–1.7 mm. long)? Furthermore, how was the hypothetical cross accomplished? The northernmost station of *D. arabisans* in the East (there, in the neighborhood of *D. glabella*) is 425 miles (684 km.) from the nearest colony of *D. aurea;* its northwesternmost station even more remote (450 miles or 772 km.) from the nearest *D. aurea* and quite as far from the nearest *D. glabella.* It would have required a relay of more than 400 unswerving and consecrated bees to transfer the requisite single pollen grain; bees are often cited as models for humans, but they have not this degree of altruism!

As to Mrs. Ekman's second proposition, that the Rocky Mountain *Draba praealta* Greene is another hybrid of *D. aurea* and *D. glabella* (*D. daurica*), little need be said. *D. praealta* is a winter-annual or very short-lived perennial of the group with *D. nemorosa.* Its northernmost area is more than 1000 miles (1600 km.) from the nearest *D. glabella* and in no character (except in being a Draba) does it suggest either *D. aurea* or *D. glabella.* It would be quite as sensible to argue that *D. nemorosa* is a hybrid of *D. aurea* and *D. verna.* No one who did so would be taken seriously.

The above cases in *Draba* and *Salix* are very typical of much of the space-filling guess-work which is too often passing as science, vagaries which suggest that when the hybridophile becomes too obsessed he is in danger of becoming the victim of hybridomania. Of such assumptions in case of *Rubus*, Professor L. H. Bailey thus speaks:

We do not elucidate the blackberry problem by the assumption of miscellaneous hybridity as if the species themselves were known and all the puzzles were mixed progeny: our work takes a new direction the moment we cease to invoke crossing as a way of escape from difficulties. The fact that certain forms are puzzling and of doubtful specific validity does not make them hybrids.

Hybrids there may be, but the first effort is to determine the species which are supposed to spawn into mongrels. Hybridity is to be accepted only on evidence; it can not be determined by the examination of usual herbarium specimens. If sexual mixtures in blackberries are as common and widespread as has been imagined, then the systematology of the group is hopeless, as if hybridity were the order of nature and species were minor phenomena. . . . . .

From his wide experience with Rubus under field conditions, Fernald long ago (Rhodora xxii, 185) exposed the danger of easily assuming hybridity. The determination of hybridism in Rubus is not so simple and easy as one might suppose: consult, for example, the posthumous resumé of the work of Bengt Lidforss in Zeitschrift für Induktive Abstammungs und Vererbungslehre, vol. 12, 1–13, Berlin 1914. Note, also, the studies of Crane and Darlington in Genetica, ix, 1927.

It is important that the systematic treatment of Rubus in North America be kept simple enough so that others than batologists (blackberry particularists, and they usually do not agree among themselves) may be able to use the information; other ways should be found to record the minor variations and to satisfy the insistent urge to nominalize; otherwise, nomenclature loses its utility.

Perhaps Rubus is one of those genera, as Bacigalupi has recently said of Cuphea (Gray Herb. Contr. xcv.) "whose many technicalities render it particularly fitting that it be left in the hands of a specialist."[1]

Along a similar line of reasoning, Professor Einar Du Rietz, discussing the attitude of "the Swedish school of salicologists," says:

if I have not misunderstood Floderus' recent papers, many of his species never form pure populations of any extension, those species thus being known only as single individuals or very small populations accidentally found here and there in the highly polymorphic syngameons classed by Floderus as hybrids. In those cases it may well be asked whether we are not on a dangerous road that may easily lead to complete dissolution of any practically applicable species-concept in those populations.

. . . . . .

This method of treatment, of course, involves the theory that the species distinguished are the primary units and the main population classed as hybrids is younger than those. This, however, is not proved. It appears quite possible that the smaller and more uniform populations classed as species are secondary units differentiated from the highly polymorphic syngameon classed as a complex of hybrids, or even only extreme forms accidentally appearing, disappearing and reappearing within this syngameon. In such a highly polymorphic syngameon any form of sufficient vitality may simulate a primary species if isolated, and to some extent even if not isolated.[2]

[1] Bailey, Gentes Herb. ii. 272, 273 (1932).

[2] Du Rietz, Svensk Bot. Tidsk. xxiv. 381, 382 (1930).

In our *Draba* population of northeastern America hybridization doubtless sometimes occurs, but, just as in most of our groups of vascular plants, the hybrids are quite obvious to those who are familiar with the true species. They do not make up a significant element in the flora, and, being chiefly sterile, they are taxonomically insignificant. The constant and freely fertile plants of definite and highly characteristic ranges surely are not demonstrated hybrids of taxonomically unrelated and geographically remote parents. In groups like *Draba*, mostly dependent on insect-pollination, "absent-treatment" hybrids must be demonstrated before they can be accepted.

In getting at types, some of which have not been discussed by others, I have met with universal kindness and courtesy. The most generous sending by Prof. Milbraed from Berlin of the actual type of *Draba Henneana* Schlechtendal has been noted. Similarly, with his well known liberality Sir William Wright Smith, Director and Regius Professor, has sent me from the Royal Botanic Garden at Edinburgh the type of *D. crassifolia* Graham. Mr. Ramsbottom and Mr. Exell, as noted, have supplied a photograph of and very detailed notes on the type of *D. glabella* Pursh preserved at the British Museum. Dr. Becherer and Mr. Macbride have sent as a gift photographs of and critical notes on four types of species described in DeCandolle's *Systema*. To all these gentlemen I here express my keen appreciation of their courtesies and aid.

In the present study, in which the problems have chiefly concerned plants of eastern Canada, Newfoundland and Labrador, I have been able to supplement the 892 sheets from this area in the Gray Herbarium and the herbarium of the New England Botanical Club with the remarkable collection in the National Herbarium of Canada, a collection made doubly valuable on account of the beautiful material from the shores of Hudson Straits and Hudson Bay secured by the late Dr. Malte and put at my disposal by Dr. R. M. Anderson. I have, furthermore, had the great advantage of receiving as a loan through Brother Marie-Victorin the invaluable collections of specimens of the Province of Quebec belonging to himself and to the University of Montreal. I have also, through the kindness of Drs. Merrill and Gleason, been able to study the material of the New York Botanical Garden and to borrow for closer examination many critical specimens. To all the gentlemen who have thus put irreplaceable collections at my disposal I extend my sincere thanks.

In view of the difficulty of the group and the admittedly tentative classification of it, at certain points, it has seemed important to illustrate very fully the more technical species, especially those which have been misinterpreted. Much obscurity and misunderstanding would have been avoided in the past if proper illustrations had accompanied the original descriptions of all species of the genus. The photographs have been most carefully and generously made by my life-long friend and a co-editor of RHODORA, Professor J. FRANKLIN COLLINS, the expenses of the photography and the making of the blocks met in part through the Wyeth Fund of the Division of Biology of Harvard University, in part through the Milton Fund for Research of Harvard University. With his accustomed great generosity and encouragement of accurate illustration, another friend of many years, who has aided me in the collection of many of the cited specimens, Mr. BAYARD LONG, has assumed the entire cost of reproduction of the half-tone blocks.

SYNOPSIS OF DRABA IN TEMPERATE EASTERN NORTH AMERICA
(east of the Great Plains and Hudson Bay)

a. Petals rounded or emarginate at summit: flowering stems with 1 or more leaves above the basal rosette, or, if scapose, with perennial bases, mostly branching caudices and marcescent remnants of old leaves along the caudices below the rosettes. . . . *b.*

b. Flowering stem a slender scape (very exceptionally with a basal leaf or bract), including the mature raceme 0.1–1 (rarely –2) dm. high, rising from a basal rosette: rosettes solitary to numerous, at the summits of short crowns or of elongate branches or branchlets of the caudex; leaves of the rosette 0.3–2 cm. long, 1–5 mm. wide: siliques 2.7–9 (very rarely –10) mm. long. (Very exceptional specimens under the next "*b*" might be sought here). . . . *c.*

c. Leaves and scapes bearing simple or elongate and forking (as well as sometimes sessile and stellate) trichomes, or leaves merely ciliate or even glabrous. . . . *d.*

d. Leaves conspicuously villous-ciliate: rachis and pedicels copiously villous-hirsute: sepals ovate to rounded-oblong, 1.5–3 mm. broad, villous-hirsute, rarely glabrous: petals yellow, 3.5–5.5 mm. long, 2.5–4 mm. broad: anthers 0.5–0.7 mm. long: seeds 1.3–1.5 mm. long . . . . . 1. *D. alpina.*

d. Leaves stiffly short-ciliate or eciliate: rachis and pedicels glabrous, short-hirtellous or stellate-tomentulose: sepals oblong, 0.5–1.8 mm. broad, glabrous or sparsely short-pubescent: petals white or becoming white in age, 2–5 mm. long, 1–4.5 mm. broad: anthers 0.2–0.5 mm. long: seeds 0.7–1.5 mm. long . . . . *e.*

e. Midribs of leaves becoming firm and prominent beneath, persisting as crowded subulate remains

on the multicipital caudices: scapes and pedicels glabrous or essentially so.

Expanding leaves with more or less stellate or furcate pubescence on the surface near the tips: sepals broad-oblong, 1.2–1.8 mm. broad: petals 3.5–5 mm. long, 2–4.5 mm. broad: anthers 0.5 mm. long: siliques oblong to narrowly ovate, 5–10 mm. long, 2–3.5 mm. broad; valves only obscurely or scarcely reticulate; septum without conspicuous median fold: seeds 16–20, often apiculate, 1–1.5 mm. long. . . . . 2. *D. fladnizensis*, var. *heterotricha*.

Expanding leaves with glabrous surfaces: sepals narrowly oblong, 0.5–1 mm. broad: petals 2–3 mm. long, 1–2 mm. broad: anthers 0.2 mm. long: siliques oblong-lanceolate, 2.7–7 mm. long, 1–2 mm. broad; valves reticulate-veiny; septum with broad median fold: seeds 10–16, rarely apiculate, 0.7–1.1 mm. long. . . . . 3. *D. Allenii*.

e. Midribs soft and evanescent: old leaves soon wilting, if persistent remaining as marcescent shreds, not as subulate remnants.

Perennial with multicipital caudex and long-persistent shreds of old leaves: leaves hispid with simple and variously forking trichomes: scape, rachis and pedicels hirtellous with simple or forking trichomes. . . . . 4. *D. rupestris*.

Short-lived perennial (sometimes biennial or annual?), with simple or but slightly branching caudex: leaves glabrous, rarely sparsely ciliate: scape, rachis and pedicels glabrous or scape sparsely hirtellous only at base. . . . . 5. *D. crassifolia*.

c. Leaves and scapes canescent-pannose with minute stellate trichomes, simple elongate trichomes wanting or very sparse.

Leaves cuneate-obovate to broadly oblanceolate, obtuse: siliques glabrous: style 0.3–0.4 mm. long: seeds 14–28, 0.7–1 mm. long. . . . . 6. *D. nivalis*.

Leaves linear or linear-oblanceolate, acute: siliques stellate-hirtellous: style 0.8–1 mm. long: seeds 8–10, 1.2–1.8 mm. long. . . . . 7. *D. Peasei*.

b. Flowering stem with 1–many leaves above the basal rosette, 1 cm.–5 dm. high: basal leaves in the perennial species 0.5–9 cm. long, 0.1–1.8 cm. broad: siliques 0.25–2 cm. long. (Very exceptional specimens of nos. 1–7 might be sought here) . . . . *f*.

f. Perennial, or nos. 8–10 biennial, with often branching caudex, the branches commonly terminating in rosettes of leaves: the biennial often simple-crowned nos. 8–10 very leafy (leaves 7–95) and with racemes often leafy-bracted at base. . . . *g*.

g. Flowering stem simple or with erect or strongly ascending branches: leaves entire or toothed, rarely laciniate: style many times shorter than the silique. at most 1.8 mm. long: seeds 10–50, 0.7–1.4 (rarely 1.7) mm. long. . . . *h*.

h. Petals deep yellow (fading in drying): cauline leaves of principal flowering stem 7–25: ovaries and siliques densely pilose; siliques lanceolate to linear-oblong, 0.7–2 cm. long, usually twisted.

Lower 4–12 flowers of the primary raceme commonly subtended by leafy bracts: pedicels erect, the lowest 5–15 mm. long in fruit.....8. *D. aurea.*
Lower flowers bractless, the lowermost only rarely subtended: pedicels spreading to arched-ascending, the lowest only 2–4 mm. long in fruit.....9. *D. minganensis.*

h. Petals white: cauline leaves 1–95: ovaries and siliques glabrous or variously short-pubescent; siliques linear-lanceolate to ovate or short-oblong, 2.5–12 (rarely–15) mm. long, if strongly twisted and more than 12 mm. long, glabrous or minutely stellate-tomentulose....*i.*

i. Biennial (rarely slightly perennial by brief persistence of basal offshoots): lower leaves of the rosettes shriveling soon after anthesis, the rosette-leaves not strongly contrasting with the lower cauline: the subspherical rosette of the 1st year loosening and elongating to form the very leafy (up to 50, rarely to 95, leaves) flowering stem: axis of raceme and pedicels densely pilose-tomentulose to villous with simple or forking hairs or with both intermixed.....10. *D. incana.*

i. Perennial, with branches of the caudex usually invested below with fibrous shreds of old leaves: new basal rosettes usually well developed at flowering time; their leaves unlike the cauline foliage: axis of raceme and pedicels glabrous, sparsely hirtellous or stellate-pubescent....*j.*

j. Foliage with all or many of its trichomes simple or elongate and irregularly forking, with or without admixed sessile or subsessile regularly stellate hairs....*k.*

k. Leaves glabrous except for sparsely ciliate margins, membranaceous, becoming translucent and conspicuously veiny (by transmitted light) in drying: plant otherwise glabrous except for hirtellous sepals: pedicels 4–10 mm. long, the lower nearly equaling the oblong-lanceolate siliques. .....11. *D. Sornborgeri.*

k. Leaves hirtellous to stellate-pubescent, firm, opaque: stems hirsute at least on the lower internodes: pedicels 0.5–7 (rarely–10) mm. long, mostly much shorter than the elliptic, oblong or lanceolate siliques....*l.*

l. Foliage with numerous simple or elongate and furcate trichomes: rosette-leaves linear-oblanceolate to narrowly spathulate or narrowly obovate, 1–6 mm. broad: mature fruiting stems 0.1–2.5 dm. high, with 1 (rarely 0)–13 (average 6) leaves: sepals 0.4–1.5 mm. broad: petals 3–4.2 mm. long: primary fruiting racemes 1/3–6/7 the full height of the plant: seeds 14–28.

Cauline leaves ovate, 3–10 mm. broad: sepals 1.8–2.6 mm. long, 1–1.5 mm. broad: petals 2–3 mm. broad: siliques oblong or oblong-lanceolate, 2–3.8 mm.

broad; the lowest on pedicels 1–5 mm. long . . . . . 12. *D. norvegica.*

Cauline leaves linear-lanceolate to narrowly ovate, 1.5–6 mm. broad: sepals 1.6–2 mm. long, 0.4–0.9 mm. broad: petals 1–1.5 mm. broad: siliques linear to linear-lanceolate, 2–2.5 mm. broad; the lowest on pedicels 4–10 mm. long. . . . . 13. *D. clivicola.*

l. Foliage with numerous stellate and several to few simple and elongate trichomes; rosette-leaves cuneate-oblanceolate, 4–9 mm. broad: mature fruiting stems 1–3.5 dm. high, with (3) 6–25 (average 10) leaves: sepals 1.3–2.3 mm. broad: petals 4.5–5 mm. long: primary fruiting racemes ¼–½ the full height of the plant: seeds 20–40 . . . . . 14. *D. laurentiana.*

j. Foliage with close stellate pubescence forming, at least on the expanding leaves, a pannose coat, simple trichomes wanting or only rarely occurring (except as cilia) on the rosette-leaves . . . . *m.*

m. Siliques plump, ovoid, ellipsoid or oblong, 2.5–10 mm. long, glabrous: sepals 1.5–2 mm. long, 1 mm. broad: seeds closely but irregularly imbricated, often turned oblique to the septum . . . . . 15. *D. pycnosperma.*

m. Siliques strongly flattened (plump only in no. 18, with densely tomentulose valves), ovate to lanceolate or linear, 5–15 mm. long, glabrous or pubescent: sepals 2–3.5 mm. long, 1–2.3 mm. broad: seeds not imbricated, lying flat against the septum . . . . *n.*

n. Siliques glabrous or only sparsely hirtellous or scabrous, strongly flattened: racemes usually bractless . . . . *o.*

o. Cauline leaves mostly rounded at base, oblong, ovate or obovate: mature siliques usually definitely veiny, flattish, plane or only slightly twisted: style obsolete or thick and short (up to 0.5 mm. long): fruiting pedicels stoutish, short; the lowest 1–6 (rarely –8) mm. long.

Stems hirsute, especially on lower internodes, with abundant simple divergent trichomes over-topping the stellate hairs: cauline leaves (3) 6–25 (average 10) . . . . . 14. *D. laurentiana.*

Stems closely stellate-pannose, sparsely or not at all hirsute on lowest internodes: cauline leaves 1 (rarely 0)–8, rarely–14 (average 4) . . . . . 16. *D. glabella.*

o. Cauline leaves narrowed or only slightly rounded at base, oblanceolate, oblong or narrowly obovate: mature siliques scarcely or only obscurely veiny, often-

est twisted, sometimes flat, very thin: style slender, 0.5–1 mm. long: fruiting pedicels slender; the lowest 3–15 mm. long: stems glabrous or minutely stellate-pubescent.....17. *D. arabisans.*

n. Siliques densely stellate-tomentulose, only slightly compressed, hardly flat: racemes usually leafy-bracted at base.....18. *D. lanceolata.*

g. Flowering stem with strongly divergent branches: leaves laciniate or subpectinate: style filiform, 1.5–3 mm. long, ¼–⅓ as long as the spirally twisted stellate-pubescent silique: seeds 7–15, 1.2–1.8 mm. long.....19. *D. ramosissima.*

f. Annuals, winter-annuals or biennials, with bractless racemes: flowering stems leafy or with at least 1 pair of leaves above the basal rosette....*p.*

p. Siliques 1.7–6 mm. long, 6–16-seeded: petals (when developed) 2–3 mm. long: stems simple, or branching nearly to summit, with the numerous small leaves strigose with variously forking trichomes.

Stems with abbreviated corymbiform branches from the middle and upper axils: siliques linear-ellipsoid, 4–6 mm. long, minutely stellate-puberulent: seeds 1–1.5 mm. long.....20. *D. aprica.*

Stems mostly with elongate or leafy branches (or simple): siliques oblong-ellipsoid, 1.7–5 mm. long, glabrous: seeds 0.5–0.8 mm. long.....21. *D. brachycarpa.*

p. Siliques 5–18 mm. long, 15–80-seeded: petals (when well developed) 2–5 mm. long: stem simple or forking only below, hispid, at least below, like the leaves.

Flowers uniform, with yellowish (finally whitish) narrowly cuneate petals about 2 mm. long: leaves scattered nearly to the slender and elongate racemes: siliques 3–13 mm. long.....22. *D. nemorosa.*

Flowers heteromorphic, some with broad white petals 3.5–5 mm. long, others with reduced petals, others apetalous and cleistagomous: leaves mostly near the base: flowering stems and branches subscapiform: racemes comparatively short and thick: siliques 6–18 mm. long.

Leaves obviously dentate, hispid with stipitate and sessile forking trichomes: fruiting raceme elongate, its rachis and pedicels pubescent.23. *D. cuneifolia.*

Leaves entire or only obscurely dentate, hirsute-ciliate with simple trichomes, stellate-pubescent on the lower surface: fruiting raceme short and umbelliform, its rachis and pedicels glabrous..24. *D. reptans.*

a. Petals deeply cleft: annuals or winter-annuals: flowering stems naked scapes arising from basal rosettes.....25. *D. verna.*

(To be continued)

PAST PERIODS OF EELGRASS SCARCITY[1]

Clarence Cottam

Fragmentary bits of evidence have been obtained which clearly indicate that there have been past periods of eelgrass (*Zostera marina*)

[1] Published with aid to Rhodora from the National Academy of Sciences.

scarcity, probably however not to be compared in intensity or completeness with the present catastrophe. In the Shooting Journal of George Henry Mackay from 1865 to 1922,[1] page 351, he records under date of March 18, 1894, "There is a great scarcity of shellfish food in this locality [Muskeget Island, Massachusetts] at present, and large quantities (acres) of the eelgrass on which the Brant feed have been killed during the past winter. Still there is a good deal left." So far as the writer has yet found, this is the only published record of an exact date when there was a scarcity of the plant; however, from many places along the coast, old time hunters or fishermen have been met who recall a time, "years ago," or "about 40 years ago," or "nearly 50 years ago," or "about 25 years ago," etc., when the plant partially or largely died out in a given section. At Penobscot Bay, Maine, a fisherman told of a time "about 40 years ago" when practically all the "grass" disappeared in the bay so that several years elapsed before it was again abundant. Forty years back would place the date in the winter of 1893–94.

Further corroborative evidence that the eelgrass was greatly reduced along much of our Atlantic coast at about this same time is contained in a letter received from Mr. H. E. Perkins of Shelter Island, New York. Mr. Perkins reported that he has records (including those of his father and others) covering a period of 80 years. Under date of January 17, 1933, he wrote that in 1894 at Penobscot, Maine, on the northern branch of the Bagaduce River " . . . the mud flats were smooth with no grass on them, but from then on the grass kept growing longer and thicker until it got so you could not row a boat through it." He further writes, "Last year [winter of 1931–32] here [New York coast] it died out as it did in most places along the Atlantic coast. As a boy I talked with the old residents about the eelgrass dying out and they told me that about 1854 . . . (it) . . . died but grew again. According to my own observation and that of others, the eelgrass in this particular part of Maine coast has died out three times in the last eighty years."

Other evidence strongly suggests that the winter of 1893–94 was one in which the eelgrass was more or less diminished along much of the coast. A guide from the Honga River Gunning Club on the Chesapeake, Dorchester County, Maryland, remarked that the eelgrass died out almost completely in his section "about 40 years ago" (1893–94) and that it was "several years" in returning. A similar account was received from a gunner on Grassy Bay, New Jersey.

Reports from different sections indicate that somewhere about 1908 there was also a subnormal growth of the plant at least over a considerable portion of the New England coast. State Warden Babson of Newburyport, Massachusetts, spoke of a serious diminution of the plant at the mouth of the Merrimac River and a fish warden from Portland, Maine, mentioned a similar scarcity over much of that coast at about that same time (1908).

[1] Edited and printed privately by Dr. John C. Phillips. The Cosmos Press, Inc., Cambridge, Mass.

From a number of sources it seems evident that there have been local periods of scarcity at many places along the Atlantic seaboard. Many of these reports were indefinite as to date. Mr. William Harrison, a member of the Maryland Game Commission, informed me that in 1889 (at the time of the Johnstown flood) the eelgrass almost died out in the Chesapeake area and that it was upwards of 25 years before the maximum growth had returned. Two fishermen at Cape Cod, Massachusetts, stated that the eelgrass was noticeably scarce in Paponesset Bay 18 years ago (1915). Supt. Geo. Snook of the Haynes-Laster Game Preserve, Portsmouth Island, North Carolina, informed me that there was a noticeable reduction in the eelgrass crop in Pamlico Sound in 1917. A crop report from France indicates that 1913[1] was a year in which but little eelgrass was produced, and that in consequence the price nearly doubled.

A number of fishermen and coastal sportsmen reported that while there never before was a time of such widespread eelgrass scarcity as now, in one or more years the supply has been much below normal. Such reports of scarcity were heard along all sections of our coast. Many, and perhaps the majority of coastal sportsmen and fishermen, maintain that there has always been at least a fair supply of eelgrass. The above information, though fragmentary, seems to point to the fact that in the memory of man there has been no period of scarcity at all comparable with the present one. The fact, however, that there have been periods of marked reduction gives considerable encouragement to the hope that this period of serious diminution will gradually pass.

The present eelgrass catastrophe abruptly became evident and widespread along most of the North American coast in 1931 and 1932, with some evidence of the trouble in a few restricted localities late in 1930. It seems that in midsummer of 1931, in most localities from North Carolina to New England, the leaves of the eelgrass became somewhat darkened, broke from their roots, and washed ashore in great windrows. Before that summer was over, less than one percent of a normal stand of the plant existed in most affected areas.

The Canadian coast south of the Gulf of St. Lawrence was denuded by the fall of 1932 and when the ice cleared away in the spring of 1933 practically the entire area of the plant's regular range in that region was 99 percent devastated.

Most of the European coast from the Mediterranean to Sweden is known to be similarly affected. The disease appeared first along the French coast during the winter season of 1931–32 and rapidly spread from that point. Our Pacific coast appears to be unaffected.

A recent survey of the Atlantic coast shows a most perplexing condition. Some areas have made a definite progressive improvement since the first onslaught of the disease; others have produced a new growth only to be laid waste a short time later, while still other

[1] Daily Consular and Trade Reports, June 30, 1914, No. 152, pp. 1988–1990, Dept. of Commerce. The Seaweed Industry of France.

sections have grown progressively worse until practically every plant has been destroyed. With a few exceptions, those areas with a reduced salinity are making the best return, notable among these are portions of Chesapeake Bay, Maryland, Shinnecock Bay and Mecox Bay, Long Island, New York, and Swanquarter, North Carolina. Areas that show little or no improvement include Woods Hole, Massachusetts, South Oyster Bay, Long Island, New York., and portions of the more open and salty bays of New Jersey. Considering our entire (Atlantic U. S.) coast as a unit there appears to be some improvement although it is altogether too soon to predict what the future of the eelgrass will be.[1]

SUMMARY

1. From available evidence the eelgrass largely disappeared over the major portion of our Atlantic coast in 1893 and 1894 and it required several years before it had come back to normal abundance.
2. At least in the New England section a subnormal crop seoms to have been produced in 1908.
3. Evidence clearly indicates that there have been a number of local periods of eelgrass scarcity along the American Atlantic and European coasts.
4. In most sections the present catastrophe became abruptly evident in 1931 and 1932 with some evidence late in 1930; on the European coast, which is seriously affected, the malady was noticed first in France in the winter of 1931–32.
5. The eelgrass at present shows a perplexing condition; some areas show improvement while others do not.
6. It is much too soon to predict what the future of the eelgrass will be, although the fact that there were previous periods of scarcity or limited production of the plant, offers some encouragement to the hope that the malady will gradually pass.

UNITED STATES BIOLOGICAL SURVEY,
Washington, D. C.

A NEW VARIETY OF GLYCERIA GRANDIS AND A KEY TO ITS ALLIED SPECIES[2]

LEON KELSO

WHILE studying the new form of *Glyceria grandis* here described the writer had occasion to note the distinguishing characters of the allied species in northwest America and all Asia. Since no key has hitherto

[1] A number of short papers have appeared dealing with the recent eelgrass scarcity. As examples see Taylor, W. R., RHODORA, Vol. 35, pp 152–154 and 186; also see Cottam, C. Plant Disease Reporter, Vol. 17, No. 6, pp 46–53.

[2] Published with aid to RHODORA from the National Academy of Sciences.

been published of all these together, and because of the difficulty of the group, the following is offered.

a. Lemma distinctly 7-nerved....*b.*
b. Second glume more than 2.9 mm. long....*c.*
c. Second glume nearly equaling the lowest lemma above it, but little longer than the first glume....*G. paludificans* Komarov.
c. Second glume not nearly equaling the lowest lemma above it, ⅕ or more longer than the first glume....*d.*
d. Panicle not drooping; all nerves of lemma except two outermost reaching to near apex; stems not decumbent at base....*e.*
e. Branches of panicle not widely spreading, or, if widely spreading, the spikelets green and 7- or fewer-flowered....*f.*
f. Lemma firm, 3–4 mm. long, obtuse or truncate at apex; second glume moderately acutish; sheaths not numerously and conspicuously septate.
G. maxima (Hartm.) Holmb.
f. Lemma thin, 3.8–4.5 mm. long, acutish at apex; second glume strongly acutish; sheaths numerously and conspicuously septate.....*G. leptolepis* Ohwi.
e. Branches of panicle at length widely spreading; spikelets 7–10-flowered; lemma entirely purple.
G. grandis var. *Komarovii.*
d. Panicle drooping; only midnerve of lemma reaching to apex; stems decumbent at base.....*G. alnasteretum* Komarov.
b. Second glume less than 2.9 mm. long....*g.*
g. Lemma less than 4.2 mm. long; sheaths not numerously and conspicuously septate and not closely clasping stem....*h.*
h. Lemma not both pale green and papillose-scabrous under a lens, and not dentate at apex; stems not decumbent at base, except in *G. lithuanica* and rarely in *G. grandis*....*i.*
i. Lemma not broadly scarious-margined....*j.*
j. Panicle, at least in upper half, drooping....*k.*
k. Lemma 3–4 mm. long, not concave at apex; second glume 1.5–2 mm. long; stems decumbent at base....*l.*
l. Spikelets greenish.....*G. lithuanica* (Gorski) Lindman.
l. Spikelets purplish.....*G. lithuanica* f. *violacea* Neumann.
k. Lemmas 2.2 mm. long or less, concave at apex; second glume 1.5 mm. or less long; stems not decumbent at base..*G. striata* var. *stricta* (Scribn.) Fernald.
j. Panicle not drooping in upper half....*m.*
m. Panicle less than 15 cm. long; lemma with nerves excurrent at apex.....*G. natans* Komarov.
m. Panicle more than 15 cm. long; nerves of lemma not excurrent at apex....*n.*
n. Spikelets 5–7 mm. long, 5–7-flowered...*G. grandis* S. Wats.
n. Spikelets 7–10 mm. long, 7–10-flowered.
G. grandis var. *Komarovii* (intermediate forms).
i. Lemma broadly scarious-margined....*o.*
o. Panicle more than 18 cm. long; branches not nodding; stem stout and rigid....*G. arundinacea* (Bieb.) Kunth.
o. Panicle less than 18 cm. long; its branches nodding; stem slender....*p.*
p. Panicle not decidedly nodding; glumes obovate, finely erose; stem erect....*G. pulchella* (Nash) K. Schum.
p. Panicle decidedly nodding; glumes ovate, entire; stem decumbent.....*G. lithuanica* (Gorski) Lindman.

h. Lemma pale green, shiny, papillose-scabrous under a lens and dentate at apex; stems decumbent or creeping at base....*q.*
q. Stems with branches at lower nodes; lemma 3–4 mm. long.....*G. viridis* Honda.
q. Stems not branched at lower nodes; lemma 2–3 mm. long.....*G. pallida* (Torr.) Trin.
g. Lemma 3.8–4.5 mm. long; sheaths numerously and conspicuously septate and closely clasping stem.....*G. leptolepis* Ohwi.
a. Lemma 5-nerved.....*G. pauciflora* Presl.

GLYCERIA GRANDIS var. **Komarovii**, var. nov., spiculis 7–10 mm. longis, 8–10-floris; lemmatibus 2.8–3.5 mm. longis.—Spikelets and lemmas larger, deep rich purple; sheaths strongly purple-tinged, otherwise similar to the species, into which it intergrades. YUKON TERRITORY: Dawson, July 17–19, 1909, *A. S. Hitchcock* no. 4362 (TYPE in U. S. Nat. Herb.); White Horse, July 14, 1909, *A. S. Hitchcock* no. 4361½. ALASKA: Fairbanks, open swamp along road, Aug. 2–10, 1909, *A. S. Hitchcock* no. 4596; Salcha Slough, June 24, 1922, *O. J. Murie* no. 309.

I take pleasure in naming this plant after Dr. V. L. Komarov, who has done more than any other to clear up the taxonomy of the Asiatic members of the genus *Glyceria*.

WASHINGTON, D. C.

THREE INTERESTING NEW PLANTS FROM WALLOWA COUNTY, OREGON[1]

M. E. PECK

THE northeast corner of Oregon, which includes the Wallowa Mts. and the western wall of the Snake River Canyon, has yielded a large number of interesting endemic species, and its resources in this particular are apparently not yet exhausted. During the past season (1933) the writer spent a month collecting in this section of Oregon, which is no less remarkable for the richness of its flora than for the magnificence of its scenery. The three following species were among the botanical rarities secured.

BOLANDRA **imnahaensis**, sp. nov., caule e rhizomate parvo bulbulis circumdato, gracile infermo erecto vel languescente 2.5–5 dm. alto glanduloso-puberulo; foliis reniformibus tenuibus fere glabris, infimis 3–7 cm. latis in petiolis 2–2.5 cm. longis 5–7-sectis, lobis paucidentatis dentibus rotundis vel acutis, foliis caulinis inferioribus brevipetiolatis stipulis magnis foliosis, superioribus sessilibus amplectentibus profunde dentatis; floribus multis laxe paniculatis in pedicellis

[1] Published with aid to RHODORA from the National Academy of Sciences.

longis filiformibus; calyce 10–14 mm. longo tubo brevi-cylindraceo in fructu haud urceolare breviore quam lobis longo-acuminatis; petalis longioribus quam lobis calycis acuminatis a basi valde nervosis obscure rubescentibus; filamentis circiter 3 mm. exsertis; stylis paullum filamenta excedentibus; carpellis maturis circiter 1 mm. conjunctis. TYPE *Peck 17495*, wet wall of a small canyon along the Imnaha River, 3 mi. above Imnaha, Wallowa Co., July 4, 1933.

The genus *Bolandra* includes, in addition to the present, two rare local species of the western United States, *B. californica Gray*, of the Sierras and *B. oregana Wats.*, of the Columbia Gorge and lower Willamette Valley. *B. imnahaensis* is more nearly related to the latter, from which it differs, among other characters, in the more numerous flowers, the narrower calyx-tube not becoming urceolate, and in the nearly separate carpels.

SAXIFRAGA **incompta**, sp. nov., caulibus e stolonibus inconspicuis brevibusque foliis minutis spathulatis tectis, plerumque solitariis erectis simplicibus vel ramosis 3–7 cm. altis minute glanduloso-pubescentibus; foliis ad basin confertis, his spathulatis vel obovatis in petiolum incertum contractis 2–3-lobatis vel infimis integris, lobis obtusis vel rotundis, foliis caulinis paucis angustis omnibus glanduloso-puberulis et paullum ciliatis; floribus paucis laxe cymosis; tubo calycis campanulato vel fere hemispherico cum ovario ad summum coalescenti 2.5–3 mm. alto, lobis purpurascentibus erectis ovatis obtusis 1.5 mm. longis; petalis 3–3.5 mm. longis anguste obovatis vix ungulatis albis 3-nervatis; filamentis anguste subulatis paullum brevioribus lobis calycis; stylis brevissimis erectis in stigmata spathulata dilatatis; seminibus minimis numerosis.—TYPE *Peck 18034*, moist north slope of Peet's Point, Wallowa Co., July 29, 1933.

A small inconspicuous species but of particular interest on account of its close relationship to *S. Nuttallii Small* (*Cascadia Nuttallii Johnson*), comprising the second known species of this section, or if we accept Johnson's segregation, of the genus *Cascadia*.

RUBUS **Bartonianus** sp. nov., frutex erectus ramosissimus cortice conciso, ramulis gracilibus badiis minute puberulis; foliis 3–5 cm. longis late ovatis vel orbiculatis plus minusve profunde cordatis 3–5-sectis, lobis acute incisis dentatis supra glabris subtus minute puberulis; floribus solitariis numerosis; lobis calycis 1–1.5 cm. longis abrupte longo-acuminatis vel interdum foliaceis dentatisque; petalis late obovatis albis circiter 2 cm. longis; stylis dense pubescentibus; fructu nigro-rubescente vel purpurascente depresso-hemispherico 1 cm. lato. —TYPE *Peck 17611*, margin of Snake River Canyon, Wallowa Co., Ore., opposite Hell Canyon, Idaho, July 12, 1933.

The writer first became acquainted with this extremely interesting shrub through fragments sent by Mrs. Ralph Barton, of Wallowa Co.,

about two years ago. It was then tentatively determined as *R. deliciosus James*, its nearest relative known to us, and apparently confined to Colorado. Specimens collected in July of the current year (1933) proved, on careful comparison with a series of specimens from the Rocky Mountain Herbarium, kindly loaned by Dr. Aven Nelson, to represent a clearly distinct species. *R. Bartonianus* differs from *R. deliciosus* in the erect habit, the more slender, much less pubescent twigs, the absence of distinct hairiness on twigs and leaves, and very conspicuously in the form of the leaves. These for the most part are broadly ovate instead of prevailingly orbicular-reniform, and sharply cleft and irregularly dentate in contrast to the broad shallow sinuses and broad rounded lobes with evenly serrate-dentate margins of the leaves of the Rocky Mountain plant. It is a pleasure to dedicate this fine species to its real discoverer.

WILLAMETTE UNIVERSITY,
Salem, Oregon

THE SYNONYMY OF PHYLLANTHUS BRASILIENSIS.—*Phyllanthus brasiliensis* (Aubl.) Poir. is the correct author-citation for the well known fish-poison which has passed in literature and herbaria as *P. Conami* Sw., *P. acuminatus* Vahl, or *P. brasiliensis* Muell. Arg. Poiret, Swartz and Mueller Argoviensis based their names on *Conami brasiliensis* of Aublet, published in 1775, while Vahl's name, though based on a different type, is generally admitted to be conspecific with the others.

For some reason, probably the misidentification of specimens by Poiret, Mueller Argoviensis refused to recognize Poiret's combination as valid, referred it to another species, and made the same combination again on the same basis but in his own name. This action doubtless is responsible for the neglect of Poiret's name by later botanists.

The essential literature is as follows:

PHYLLANTHUS BRASILIENSIS (Aubl.) Poir. Encycl. v. 296 (1804). *Conami brasiliensis* Aubl. Guyan. ii. 926, iv. t. 354 (1775). *Phyllanthus Conami* Sw. Prodr. 28 (1788). *P. acuminatus* Vahl, Symb. Bot. ii. 95 (1791). *P. brasiliensis* Muell. Arg. in DC. Prod. xv. pt. 2, 383 (1866).—L. B. SMITH, Gray Herbarium.

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THE NEW ENGLAND BOTANICAL CLUB

Vol. 36. August, 1934. No. 428.

CORNUS AMOMUM AND CORNUS CANDIDISSIMA[1]

H. W. Rickett

The name *Cornus Amomum* Miller is generally applied to a species of dogwood of the eastern United States, characterized by a rusty-brown silky pubescence of the leaves and twigs, and by blue fruits which contain compressed, longitudinally ridged stones. A closely related species or variety, common in the central states, differs in its somewhat narrower leaves, and in its pubescence, which is of a white or yellowish color; close examination discloses also that the lower surface of the leaves is covered with minute papillae.

In listing the plants of Columbia, Missouri, I was undecided (Univ. Mo. Stud. **6**: 57. 1931) what name should be used for the latter form. This led to an examination of the nomenclatural history of *C. Amomum*, with results which may be of general interest.

Miller, in describing *C. Amomum* (Gard. Dict. ed 8. 1768), gave as a synonym the species described by Plukenet (Phyt., tab. 169, fig. 3. 1691) as *Cornus americana sylvestris, domesticae similis, bacca caerulei coloris elegantissima, Amomum Novae-Angliae quorundam.* Later (Almag.: 120. 1696) Plukenet characterized the same species as *Cornus foemina, laurifolia, fructu nigro caeruleo, ossiculo compresso, Virginiana.* In the earlier editions of the Dictionary, Miller used the latter description. In the seventh edition (1759) all the species were rearranged and redescribed; that in question became *Cornus arborea foliis ovatis petiolatis, floribus corymbosis terminalibus.* In the eighth edition the specific epithet (*Amomum*) was inserted.

[1] Published with aid to Rhodora from the National Academy of Sciences.

There is nothing in all this to indicate with certainty which of the blue-fruited species of *Cornus* was actually meant. The descriptions of species, however, are followed, in all editions of the Dictionary, by a general section which deals mainly with the propagation and uses of the dogwoods. In the eighth edition we read: "The shoots of the fifth sort [*C. Amomum*] are of a beautiful red colour in winter; and in summer the leaves being large, of a whitish colour on their under side, and the bunches of white flowers growing at the extremity of every branch, renders this shrub valuable; and in autumn, when the large bunches of blue berries are ripe, they make a fine appearance." Of this Farwell (Rhodora **33**: 68. 1931) says "I was puzzled to understand how such a good description of *Cornus stolonifera* could apply to the current understanding of *C. Amomum*." Although I cannot claim an acquaintance with *Cornus* comparable with that of this author, I was myself puzzled that a description involving blue fruits should be considered so readily applicable to *C. stolonifera*.[1] In fact, the above description seems to make matters worse in attempting to interpret *C. Amomum*.

A study of the earlier editions of the Dictionary obviates the necessity for this confusion. The sentence quoted appears first in the sixth edition (1752), differing only in that it begins: "The shoots of the sixth sort are of a beautiful red colour . . ." The species so numbered is not *C. Amomum* but *Cornus foemina, candidissimis foliis, Americana* (*C. candidissima* of ed. 8). In the seventh edition the species were renumbered, and the sentence in question was transferred from one species to another (curiously enough, no change was necessary in the wording of this particular observation, for the species to which it referred retained the same number). We may conclude that the transfer was an accident, which might easily pass unnoticed in a work of the scope of the Dictionary. The eighth edition, as far as concerns *Cornus*, was a reprint of the seventh, with the insertion of specific epithets. It is possible, therefore, to disregard the offending sentence in interpreting *C. Amomum*. It is perhaps worthy of note that in the sixth abridged edition of the Dictionary (1771), the epithet *Amomum* was applied to *C. alba* L., the "wild Tartarian dogwood," which goes to show that Miller was not incapable of such slips in compiling the successive editions of his great work.

As Farwell says, specimens which would authenticate the older

[1] I am indebted to Dr. Fernald for confirming my supposition that the fruits of *C. stolonifera* are regularly white; with at most a slight tinge of violet around the base.

descriptions of *C. Amomum* are unfortunately not to be found. Since the descriptions themselves are inadequate to fix its identity, we may perhaps rely on the usage of Miller's time. Lamarck (Encycl. **2**: 116. 1786) was apparently the first to describe in unmistakeable terms the rusty-pubescent species known today as *C. Amomum*. He named it *C. caerulea*, quoting the description by Plukenet used by Miller as a basis for *C. Amomum*. L'Héritier, who described it (Cornus: 5. 1788) under the name *C. sericea* L., Ehrhart, who named it *C. rubiginosa* (Beitr. **4**: 15. 1789), and Moench, who called it *C. cyanocarpus* (Meth.: 108. 1794[1]), cited *C. Amomum* as a synonym. Pursh treated it (Fl. Amer. Sept. **1**: 108. 1814) as *C. sericea* Willd., identifying it with the above names and with *C. alba* Walt. His specimen in the Hooker herbarium at Kew, labeled *C. alba*, is our *C. Amomum*. The older collectors represented in the Hooker herbarium mostly designated this species as *C. sericea* L.; I have seen no specimen of any other species labeled *C. Amomum*.

The best procedure is therefore to let *C. Amomum* Mill. stand in the sense in which it has been almost universally used, excluding the reference to red shoots, white leaves, etc. The probability that Miller's species was actually that which is so designated today is increased by the existence in the Linnaean herbarium of a specimen of *C. Amomum* as currently understood, and so labeled (not, however, in Linné's hand).[2]

The name *Cornus sericea* L. has had a chequered career. The original description (Linn. Mant. **2**: 199. 1771) agrees well with *C. stolonifera* Michx., except for the reference to Plukenet and the color of the fruit ("simillima *C. sanguineae* et *albae*, ut difficile distingatur, sed Baccae atro-purpureae"). The specimen, moreover, in the Linnaean herbarium is, as Farwell discovered, and as Gray noted on the sheet itself, *C. stolonifera* Michx. Linné was perhaps working from the dried specimen only, and wrongly identified it with Plukenet's blue-fruited species. Murray (Syst. Veg. ed. 13: 134. 1774) excluded the synonym and interpreted it in accordance with the specimen. Willdenow, however (Sp. Pl. ed. 4: 663. 1798) took the other course, and

[1] Moench published *C. cyanocarpus in* an earlier work (Verzeichn.: 26. 1785), but without adequate description, and in addition to *C. Amomum* Mill. In the later publication he united both these under the former name.

[2] If *C. Amomum* is rejected as a nomen dubium, or applied to another species, the legitimate name of the species now so designated is *C. caerulea* Lam. Moench's previous *C. cyanocarpus* (besides being somewhat ambiguous) cannot be adopted, since in this publication he did not use the binomial system consistently (see Rep't. Bot. Exch. Club **10**: 305. 1933).

identified it with *C. Amomum* Mill. and *C. rubiginosa* Ehrh. Most collectors seem to have followed Willdenow in this, and since this name, which might otherwise be applied to *C. stolonifera* Michx., has come to be very generally regarded as a synonym of *C. Amomum* Mill., I propose that *C. sericea* L. be included in the list of nomina ambigua.

For the related form with whitish pubescence and narrower, micropapillose leaves, the earliest specific name seems to be *C. Purpusi* Koehne (Gartenfl. **48**: 338. 1899). Certain collectors have recently taken up *C. obliqua* Raf. (West. Rev. **1**: 229. 1819[1]). The description of the latter is of a shrub with leaves yellowish-glaucous beneath, quite smooth on both surfaces, and oblique at the base; the berries blueish white. The glabrous leaves and pale fruits do not agree well with *C. Purpusi* Koehne, but suggest rather *C. stricta* Lam. The obliquity of the leaves at the base is a very variable character, and occurs in several species. *C. obliqua* Raf. must therefore share the fate of many species of *Cornus* which he proposed (Alsogr.: 58 et seq. 1838) differentiated chiefly by leaf and twig characters. Wangerin (Engl. Pflanzenr. **4**, 229: 91. 1910) lists several of these as nomina dubia. It is noteworthy that *C. obliqua* was not maintained by Rafinesque himself in the Alsographia.

In any case, it is questionable whether this form should be treated as a distinct species. I have seen specimens from Texas and Oklahoma which resemble *C. Amomum* in pubescence but *C. Purpusi* in leaf shape and in the presence of papillae. Many specimens of the latter show a tendency toward a rusty pubescence, especially on the veins and buds; this is a rather variable character in several species. Leaf characters are notably unstable in *Cornus*. It seems preferable, therefore, to treat *C. Purpusi* as a variety of *C. Amomum*. The first varietal epithet is that of Meyer (Mem. Acad. Imp. Sci. St. Petersb. **6**. 1845), who described it as *C. sericea* L. γ *Schuetzeana*.[2]

The descriptive matter excluded from the interpretation of *C. Amomum* may throw some light on the identity of *C. candidissima* Mill., to which it was originally applied. Systematists have been generally undecided whether this was the species currently known as *C. racemosa* Lam. (*C. paniculata* L'Hér.), or the more southern *C. stricta* Lam. Coulter and Evans (Bot. Gaz. **15**: 88. 1890), united

[1] In the Index Kewensis the name *C. obliqua* Raf. is referred to Ann. Nat.: 13 (1820). This, however, is not the place of first publication; nor is it as full a description as the earlier one.

[2] Var. *albescens* Farwell, l. c.: 70, thus being superfluous.

them under the name *C. candidissima* Marsh. Wangerin (l. c.: 57) treats them as *C. femina* Mill. Most collectors of today seem to have little difficulty in separating the two, and the intergradations may be due to hybridization. Farwell (l. c.: 71) argues that *C. candidissima* Mill. is *C. paniculata* L'Hér.

The species was founded on Plukenet's *Cornus foemina, candidissimis foliis, Americana* (Almag.: 120. 1696), and appeared first in the sixth edition of the Dictionary (1752). In the seventh edition it became *Cornus arborea foliis lanceolatis, acutis, glabris, umbellis involucro minoribus, baccis ovatis.*

Gronovius (Fl. Virg.: 17. 1739) described a *Cornus foemina, floribus candidissimis umbellatim dispositis, baccis caeruleo-viridibus, ossiculo duro compresso biloculari,* and quoted as synonym Plukenet's species identified by Miller with *C. candidissima.* Clayton's specimen (No. 23), upon which this species is based, is in the herbarium of the British Museum. It consists of several well-preserved flowering shoots of *C. stricta* Lam., with leaves pale and glabrous beneath, sparingly pubescent above, and twigs of a deep red color. If we take into consideration Miller's and Gronovius' citations from Plukenet, this constitutes about as good evidence as can be expected that *C. candidissima* Mill. is the same as *C. stricta* Lam. This interpretation is supported by the sentence referring to its red shoots and blue fruits, which are characters more applicable to *C. stricta* than to *C. racemosa.* Certainly if *C. stricta* and *C. racemosa* are treated as one species, *C. candidissima* Mill. is the best name for it, since it can be thus associated with a definite specimen.

Farwell discusses, and dismisses as of no significance, the troublesome *umbellis involucro minoribus* of Miller's description. It is interesting to notice that on Clayton's specimen appears *Cornus arborea, umbellis involucro destitutis, periantho minimo.* Is it possible that Miller saw this specimen or a duplicate of it, or that the descriptive phrase was communicated to him, and that *destitutis* somehow became *minoribus?* On the sheet also is written "Flowers of a Shrub called here Swamp Dogwood." It may be significant that Miller used the same common name for his *C. candidissima.*

Whether or not *C. foemina* Mill. can be interpreted as *C. racemosa* Lam. (*C. paniculata* L'Hér.) is a matter of opinion apparently unsupported by critical descriptions or specimens.

My understanding of the species discussed above may be summarized as follows:

C. Amomum Mill., Gard. Dict. (1768); *C. caerulea* Lam., Encycl. **2**: 116 (1786); *C. rubiginosa* Ehrh., Beitr. **4**: 15 (1789); *C. cyanocarpus* Moench, Meth.: 108 (1794); *C. sericea* Willd., Sp. Pl. ed. 4: 663 (1798).

C. Amomum Mill. var. **Schuetzeana** (Meyer), comb. nov.; *C. sericea* L. γ *Schuetzeana* Meyer in Mem. Acad. Imp. Sci. St. Petersb. **6** (1845); *C. cyanocarpus* Moench var. *albescens* Farwell in Rhodora **33**: 70 (1931); *C. Purpusi* Koehne in Gartenfl. **48**: 338 (1899).

C. candidissima Mill., l. c.; *C. stricta* Lam., l. c.

This study was made possible by the courtesy of many persons connected with the herbarium of the Royal Botanic Gardens, Kew, with the herbarium of the British Museum (Natural History), and with the Linnaean herbarium in Burlington House, Piccadilly; also by a leave of absence granted by the University of Missouri.

Department of Botany,
University of Missouri

PLANTS COLLECTED IN THE SOUTHERN REGION OF JAMES BAY[1]

David Potter

The following list of plants collected by the writer during the summer of 1929 is published with the hope that not only will it furnish additional information concerning the geographical ranges of the plants herein enumerated, but also will serve as an aid to anyone who, at a later date, may explore for plants in this general region.

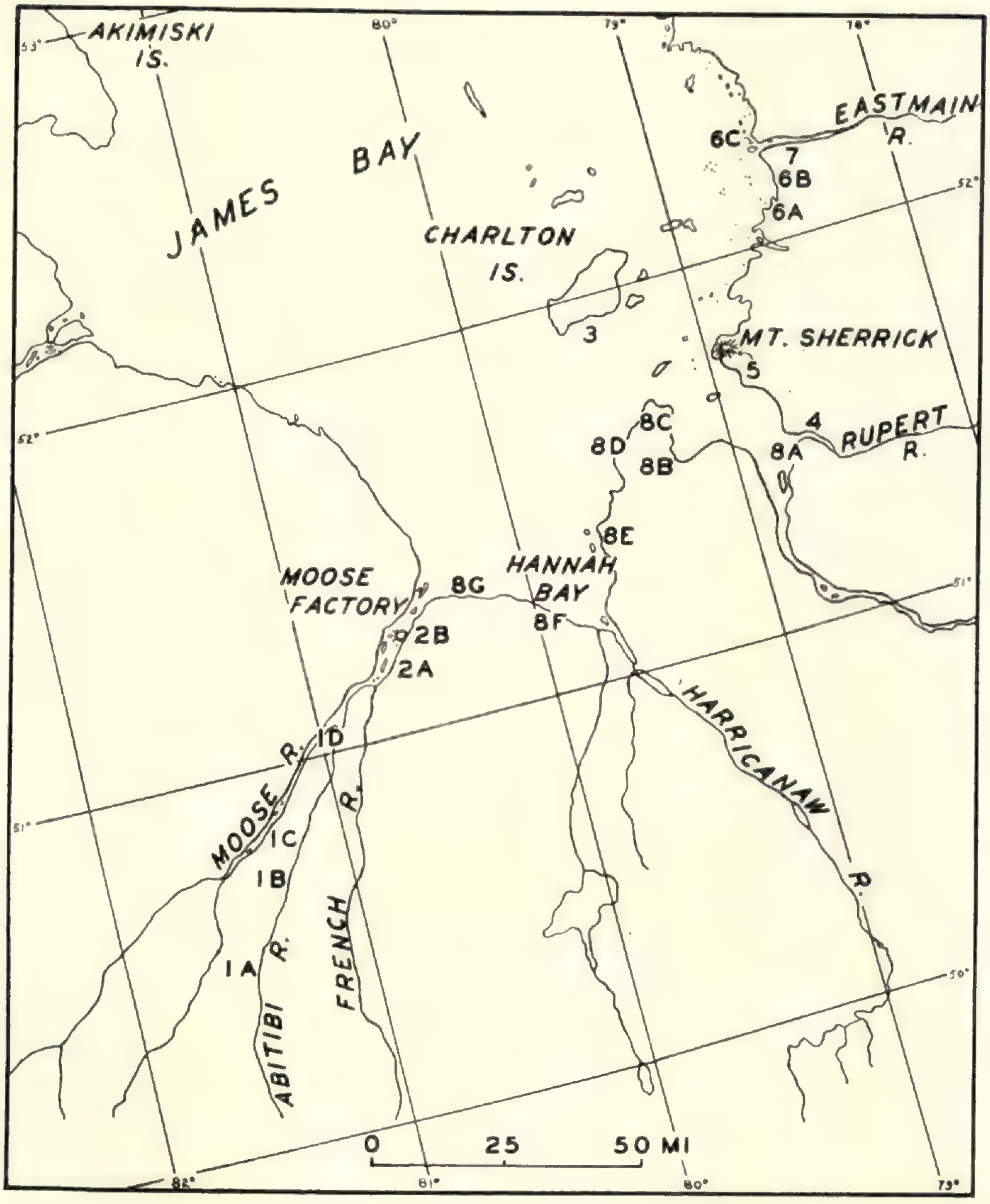
Certain interesting phytogeographical problems suggested by the occurrence of some of the plants listed have already been discussed by the writer.[2]

The general regions botanized are indicated by Arabic numerals and the approximate collecting points are shown on the accompanying map by the same legend plus the letters as indicated in the following key.

1. Abitibi River:—from Coral Rapids to its mouth.
   - A. Long Rapids
   - B. Blackstone Rapids
   - C. Nine Mile Rapids
   - D. Allen Island, at the mouth of the river.
2. Moose River:—from the mouth of the Abitibi River to the mouth of the Moose River.

[1] Published with aid to Rhodora from the National Academy of Sciences.

[2] Potter, David, Botanical Evidence of Post-Pleistocene Marine Connection Between Hudson Bay and the St. Lawrence Basin. Contributions from the Gray Herbarium of Harvard University, XCIX. (Rhodora, **34**, May and June, 1932.)



A. Near the mouth of the Abitibi River.
B. Many islands near the mouth of the Moose River including Moose, Saw Pit, Bushy, Willowy and Hasey.

3. Charlton Island:—along the coast five miles southeast and three miles northwest of the Hudson Bay Post and two miles inland.
4. Rupert River:—from its mouth to two miles above the Hudson Bay Post.
5. Mt. Sherrick:—from the coast to the top of the mountain, altitude 700 feet.
6. East Coast:—from Mt. Sherrick to the mouth of the Eastmain River.
   A. Ten miles south of the mouth of the Eastmain River.
   B. Nine miles south of the mouth of the Eastmain River.
   C. Dilly Dally Island.

7. Eastmain River:—from its mouth to two miles above the Hudson Bay Post.
8. South Coast:—from the mouth of the Rupert River to the mouth of the Moose River.
   A. Middleton Island.
   B. Cabbage Willows.
   C. Point Comfort.
   D. 15 miles west of Point Comfort.
   E. Twin Islands.
   F. Hannah Bay.
   G. Approximately half way between Hannah Bay and the mouth of Moose River.

The plants are listed by families following the system used in Gray's Manual of Botany, seventh edition. In all cases a mounted specimen has been deposited in the Gray Herbarium of Harvard University.

	1	2	3	4	5	6	7	8
POLYPODIACEAE								
Thelypteris Dryopteris (L.) Slosson				×				
spinulosa (O. F. Müller) Nieuwl.				×			×	
spinulosa, var. americana (Fisch.) Weatherby					×			
Pteretis nodulosa (Michx.) Nieuwl.	×	×						
OPHIOGLOSSACEAE								
Botrychium Lunaria (L.) Sw.			×					
EQUISETACEAE								
Equisetum arvense L.	×	×	×	×	×	×	×	
palustre L.	×	×						
variegatum Schleich		×				×		
scirpoides Michx.	×							
limosum L.	×	×					×	
LYCOPODIACEAE								
Lycopodium Selago L.					×			
lucidulum Michx.							×	
obscurum L., var. dendroideum (Michx.) D. C. Eaton					×			
annotinum L.	×				×			
annotinum, var. pungens Desv.					×		×	
clavatum L., var. megastachyon Fern. and Biss.					×			
complanatum L.						×	×	
SELAGINELLACEAE								
Selaginella selaginoides (L.) Link			×					
PINACEAE								
Pinus Banksiana Lamb.					×			
Larix laricina (DuRoi) Koch	×		×	×	×			
Picea glauca (Moench) Voss		×	×	×				
mariana (Mill.) BSP					×			

	1	2	3	4	5	6	7	8
PINACEAE—(*Continued*)								
ABIES BALSAMEA (L.) Mill.		×		×				
THUJA OCCIDENTALIS L.	×	×						
JUNIPERUS COMMUNIS L., var. DEPRESSA Pursh.					×			
COMMUNIS, var. MONTANA Ait.			×		×		×	
HORIZONTALIS Moench.								×
TYPHACEAE								
TYPHA LATIFOLIA L.								×
SPARGANIACEAE								
SPARGANIUM ANGUSTIFOLIUM Michx.								×
NAJADACEAE								
POTAMOGETON FILIFORMIS Pers., var. MACOUNII Morong			×					
FILIFORMIS Pers. var. BOREALIS (Raf.) St. John						×		×
ZANNICHELLIA PALUSTRIS L. var. MAJOR (Boenningh.) Koch								×
JUNCAGINACEAE								
TRIGLOCHIN MARITIMA L.			×	×	×	×	×	×
PALUSTRIS L.								×
ALISMACEAE								
SAGITTARIA CUNEATA Sheldon		×						×
GRAMINEAE								
HIEROCHLOE ODORATA (L.) Wahlenb.	×	×	×			×		
ORYZOPSIS PUNGENS (Torr.) Hitchc.			×		×			
CANADENSIS (Poir.) Torr.							×	
PHLEUM PRATENSE L.				×				
AGROSTIS STOLONIFERA L. (*A. alba* of authors)		×						
CALAMAGROSTIS CANADENSIS (Michx.) Nutt., var. ROBUSTA Vasey					×		×	
NEGLECTA (Ehrh.) Gaertn., Meyer & Scherb.						×		×
INEXPANSA Gray, var. AMERICANA (Vasey) Stebbins			×					
DESCHAMPSIA CESPITOSA (L.) Beauv., var. GLAUCA (Hartm.) Lindm.	×	×						
CESPITOSA, var. LITTORALIS (Reut.) Richter	×	×		×				×
POA PRATENSIS L.		×	×	×			×	×
EMINENS J. S. Presl					×			
ALPINA L.			×	×				
ALPINA, var. BREVIFOLIA Gaudin							×	
ANNUA L.							×	
GLAUCA Vahl								×
NEMORALIS L.	×			×		×		
PALUSTRIS L.		×		×				
GLYCERIA STRIATA (Lam.) Hitchc., var. STRICTA (Scribn.) Fernald				×				
FESTUCA RUBRA L.		×	×	×		×		×
RUBRA, var. ARENARIA (Osbeck) Fries					×		×	×
RUBRA, var. MEGASTACHYS Gaudin								×

	1	2	3	4	5	6	7	8
GRAMINEAE—(*Continued*)								
HORDEUM JUBATUM L.				×				×
ELYMUS ARENARIUS L., var. VILLOSUS E. Meyer			×		×			×
CYPERACEAE								
ELEOCHARIS PALUSTRIS (L.) R. & S., var. TYPICA Rouy				×		×	×	×
UNIGLUMIS (Roth) R. & S.			×			×		
PAUCIFLORA Lightf.						×		
CALVA Torr.	×	×		×				×
SCIRPUS CESPITOSUS L., var. CALLOSUS Bigelow					×			
HUDSONIANUS (Michx.) Fernald					×			
RUFUS (Huds.) Schrad.		×	×				×	
AMERICANUS Pers.		×						
VALIDUS Vahl		×						×
RUBROTINCTUS Fernald		×						
ERIOPHORUM CHAMISSONIS C. A. Meyer					×	×		
OPACUM (Bjornstr.) Fernald	×				×			
SPISSUM Fernald					×			
VIRIDI-CARINATUM (Engelm.) Fernald				×				
CAREX CRAWFORDII Fernald				×				
EXILIS Dewey					×			
ANGUSTIOR Mackenz.							×	
CANESCENS L.				×				
CANESCENS, var. SUBLOLIACEA Laestad		×					×	
BRUNNESCENS Poir.				×	×			
BRUNNESCENS, var. SPHAEROSTACHYA (Tuck.) Kukenth.				×			×	
TRISPERMA Dewey				×				
NORVEGICA Willd.								×
GLAREOSA Wahlenb., var. AMPHIGENA Fernald					×	×		
DISPERMA Dewey	×							
CHORDORHIZA L. f.								×
CAPITATA L.					×	×		
PALEACEA Wahlenb., var. TRANSLANTICA Fernald (*C. maritima* of Am. authors)		×	×	×	×	×	×	×
SALINA Wahlenb., var. KATTEGATENSIS (Fries) Almq.		×				×		
AQUATILIS Wahlenb.	×		×	×	×			
HAYDENI Dew.	×							
AUREA Nutt.								×
PAUCIFLORA Lightf.				×				
LEPTALEA Wahlenb.		×			×			
LIVIDA (Wahlenb.) Willd., var. GRAYANA (Dewey) Fernald					×			
VAGINATA Tausch		×	×					
PAUPERCULA Michx.				×				
LIMOSA L.					×			
RARIFLORA Smith						×		
EBURNEA Boott		×						
CONCINNA R. Br.		×	×			×		
CAPILLARIS L.		×			×	×		×
HOUGHTONII Torr.		×						
SAXATILIS L., var. MILIARIS (Michx.) Bailey						×		×
SAXATILIS, var. RHOMALEA Fernald						×		
ROSTRATA Stokes			×					×
MICROGLOCHIN Wahlenb.						×		

	1	2	3	4	5	6	7	8
JUNCACEAE								
JUNCUS GERARDI Loisel								×
DUDLEYI Wiegand		×						
BALTICUS Willd., var. LITTORALIS Engelm	×				×		×	×
FILIFORMIS L.				×			×	
ALPINUS Vill.							×	
LUZULA PARVIFLORA (Ehrh.) Desv.				×			×	
LILIACEAE								
TOFIELDIA GLUTINOSA (Michx.) Pers.						×		
ALLIUM SCHOENOPRASUM L., var. SIBIRICUM (L.) Hartm.						×	×	
LILIUM PHILADELPHICUM L., var. ANDINUM (Nutt.) Ker.		×						
CLINTONIA BOREALIS (Ait.) Raf.	×				×			
SMILACINA STELLATA (L.) Desf.	×	×	×		×			×
TRIFOLIA (L.) Desf.				×	×		×	
STREPTOPUS AMPLEXIFOLIUS (L.) DC.				×				
ROSEUS Michx.		×						
IRIDACEAE								
IRIS VERSICOLOR L.			×	×	×		×	×
ORCHIDACEAE								
CYPRIPEDIUM PARVIFLORUM Salisb.	×	×						
HABENARIA VIRIDIS (L.) R. Br., var. BRACTEATA (Muhl.) Gray		×						×
VIRIDIS, var. INTERJECTA Fern.	×							
HYPERBOREA (L.) R. Br.		×	×					×
DILATATA (Pursh) Gray, var. MEDIA (Rydb.) Ames				×				
OBTUSATA (Pursh) Richards		×	×			×		
LISTERA CORDATA (L.) R. Br.			×					
CALYPSO BULBOSA (L.) Oakes	×		×					
SALICACEAE								
SALIX LUCIDA Muhl., var. ANGUSTIFOLIA Anders.		×						
LONGIFOLIA Muhl.	×	×						
GLAUCOPHYLLOIDES Fernald		×	×					
MYRTILLIFOLIA Anders.			×					
ADENOPHYLLA Hook.		×						
DISCOLOR Muhl.				×				
BEBBIANA Sargent	×	×					×	
CANDIDA Flügge			×			×	×	
CANDIDA, var. DENUDATA And.		×						×
PLANIFOLIA Pursh						×		
HUMILIS Marsh., var. KEWEENAWENSIS Farwell							×	
PEDICELLARIS Pursh, var. HYPOGLAUCA Fernald				×	×		×	
BRACHYCARPA Nutt.			×		×	×		×
CORDIFOLIA Pursh, var. CALLICARPAEA (Trautv.) Fernald						×		×
LUTEA Nutt.		×						
CORDATA Muhl.		×						
POPULUS TREMULOIDES Michx.			×				×	
TACAMAHACCA Miller	×	×	×			×		×
TACAMAHACCA, var. MICHAUXI (Dode) Farwell		×						

	1	2	3	4	5	6	7	8
MYRICACEAE								
Myrica Gale L.			×		×	×		×
BETULACEAE								
Betula papyrifera Marsh.		×		×	×			
papyrifera, var. cordifolia Regel				×	×			
papyrifera, var. minor Tuckerm.		×						
glandulosa Michx.			×					
microphylla Bunge				×				
Alnus crispa (Ait.) Pursh.	×						×	
incana (L.) Moench		×		×			×	
URTICACEAE								
Urtica gracilis Ait.				×			×	
SANTALACEAE								
Geocaulon lividum (Richardson) Fernald (Comandra livida Richards.)			×		×		×	
POLYGONACEAE								
Rumex occidentalis Wats.			×	×			×	
mexicanus Meisn.						×		
Acetosella L.				×				
Polygonum aviculare L.				×				×
viviparum L.		×					×	
Convolvulus L.				×				
CHENOPODIACEAE								
Chenopodium album L.				×				
Atriplex patula L.								×
CARYOPHYLLACEAE								
Arenaria lateriflora L.			×		×			×
peploides L.			×		×	×		×
Stellaria borealis Bigel.			×					
crassifolia Ehrh.								×
longipes Goldie, var. laeta (Richards.) Wats.			×			×	×	×
longifolia Muhl.		×		×			×	
media (L.) Cyrill.				×				
Cerastium arvense L.						×	×	×
vulgatum L.		×						
alpinum L.			×					
NYMPHAEACEAE								
Nymphozanthus variegatus (Engelm.) Fernald					×			
RANUNCULACEAE								
Ranunculus aquatilis L., var. capillaceus DC.								×
Cymbalaria Pursh				×	×	×	×	×
Purshii Richards							×	
abortivus L.		×		×				
Thalictrum confine Fernald	×	×					×	×
polygamum Muhl.		×						
venulosum Trelease			×					
Anemone parviflora Michx.	×					×		

	1	2	3	4	5	6	7	8
RANUNCULACEAE—(*Continued*)								
Anemone multifida Poir.			×					
canadensis L.	×	×		×			×	×
quinquefolia L.		×						
Caltha palustris L.		×	×	×			×	
Coptis groenlandica (Oeder) Fernald					×		×	
Actaea rubra (Ait.) Willd.		×	×	×				
CRUCIFERAE								
Draba luteola Greene			×			×		
incana L.				×				
rupestris R. Br.						×		
Capsella Bursa-pastoris (L.) Medic.				×			×	
Braya humilis (C. A. Mey.) Robinson	×	×						
Rorippa palustris (L.) Moench							×	
Arabis humifusa (J. Vahl) S. Wats.			×					
DROSERACEAE								
Drosera rotundifolia L., var. comosa Fernald						×		
longifolia L.					×			
SAXIFRAGACEAE								
Mitella nuda L.	×	×	×	×			×	
Parnassia multiseta (Ledeb.) Fernald			×			×		×
Ribes lacustre (Pers.) Poir.	×	×						
glandulosum Grauer				×		×	×	
triste Pallas, var. albinervium (Michx.) Fernald		×	×					
hirtellum Michx.		×		×	×	×		
hirtellum Michx., var. calcicola Fernald								×
ROSACEAE								
Physocarpus opulifolius (L.) Maxim.	×	×						
Pyrus americana (Marsh.) DC.	×	×		×	×		×	
Amelanchier sanguinea (Pursh) DC.			×			×		
Bartramiana (Tausch) Roemer					×		×	
Fragaria virginiana Duchesne	×	×		×				
virginiana, var. terrae-novae (Rydb.) Fern. & Wieg.		×	×		×		×	×
Potentilla norvegica L., var. hirsuta (Michx.) Lehm.		×		×				
palustris (L.) Scop.				×	×		×	×
tridentata Ait.			×	×	×		×	
fruticosa L.	×				×			×
Anserina L.	×	×		×	×	×	×	
Geum macrophyllum Willd.				×			×	
strictum Ait.								×
rivale L.	×	×	×		×			
Rubus idaeus L., var. strigosus (Michx.) Maxim.		×					×	
idaeus, var. canadensis Richardson		×		×				
Chamaemorus L.				×	×			
triflorus Richards	×	×	×	×	×			×
arcticus L.					×			
acaulis Michx.			×			×	×	×
Rosa acicularis Lindl.	×	×	×				×	×
Prunus pennsylvanica L. f.							×	

	1	2	3	4	5	6	7	8
LEGUMINOSAE								
TRIFOLIUM PRATENSE L.	×							
REPENS L.	×	×		×			×	
OXYTROPIS JOHANNANSIS Fernald	×	×						
VICIA CRACCA L.				×				
AMERICANA Muhl.		×						
LATHYRUS JAPONICUS Willd., var. ALEUTICUS (Greene) Fernald			×			×	×	×
PALUSTRIS L., var. LINEARIFOLIUS Seringe		×			×	×		×
LINACEAE								
LINUM LEWISII Pursh			×					
POLYGALACEAE								
POLYGALA SENEGA L.	×							
EMPETRACEAE								
EMPETRUM NIGRUM L.			×		×		×	
RHAMNACEAE								
RHAMNUS ALNIFOLIA L'Hér.	×	×						
VIOLACEAE								
VIOLA PALLENS (Banks) Brainard				×				
NEPHROPHYLLA Greene	×	×						×
LABRADORICA Schrank					×			
ELAEAGNACEAE								
ELAEAGNUS ARGENTEA Pursh	×		×		×			×
SHEPHERDIA CANADENSIS (L.) Nutt.			×		×	×		×
ONAGRACEAE								
EPILOBIUM ANGUSTIFOLIUM L.							×	×
ANGUSTIFOLIUM, var. INTERMEDIUM (Wormsk.) Fernald			×			×		
PALUSTRE L.								×
LACTIFLORUM Haussk.			×					×
DAVURICUM Fisch.								×
OENOTHERA MURICATA L.								×
CIRCAEA ALPINA L.							×	
HALORAGIDACEAE								
MYRIOPHYLLUM EXALBESCENS Fernald								×
HIPPURIS VULGARIS L.							×	×
VULGARIS, var. MARITIMA Hartm.							×	
ARALIACEAE								
ARALIA NUDICAULIS L.	×	×						
UMBELLIFERAE								
SANICULA MARILANDICA L., var. BOREALIS Fernald	×	×						
CICUTA MACULATA L.								×
CARUM CARVI L.				×				
SIUM SUAVE Walt.		×	×					×
LIGUSTICUM SCOTHICUM L.						×		×
HERACLEUM LANATUM Michx.			×	×	×		×	×
ANGELICA ATROPURPUREA L.			×					

	1	2	3	4	5	6	7	8
CORNACEAE								
Cornus canadensis L.	×	×		×	×	×	×	
stolonifera Michx.	×	×		×		×	×	
ERICACEAE								
Moneses uniflora (L.) Gray	×	×		×				
Pyrola minor L.				×				
secunda L., var. obtusata Turcz.		×	×		×			
chlorantha Sw.	×					×	×	
grandiflora Rad.			×					
asarifolia Michx., var. incarnata (Fisch.) Fernald								×
Ledum groenlandicum Oeder			×	×	×		×	
Kalmia polifolia Wang.					×			
Andromeda glaucophylla Link					×	×		
Chamaedaphne calyculata (L.) Moench				×				
Arctostaphylos Urva-ursi (L.) Spreng., var. coactilis Fernald & MacBride			×					
rubra (Rehder & Wilson) Fernald						×		
Chiogenes hispidula (L.) T. & G.				×				
Vaccinium angustifolium Ait., var. myrtilloides (Michx.) House				×	×		×	
canadense Kalm	×							
uliginosum L.					×			
cespitosum Michx.			×				×	
Vitis-idaea L., var. minus Lodd.			×		×	×		
Oxycoccus L.				×	×			
PRIMULACEAE								
Primula mistassinica Michx.	×	×	×					
egaliksensis Wormskj.					×	×	×	
Lysimachia thyrsiflora L.		×						
Trientalis americana (Pers.) Pursh	×		×	×	×		×	
Glaux maritima L., var. obtusifolia Fernald					×	×		
GENTIANACEAE								
Menyanthes trifoliata L., var. minor Michx.				×	×			
BORAGINACEAE								
Mertensia paniculata (Ait.) G. Don	×	×		×		×	×	×
LABIATAE								
Scutellaria epilobiifolia A. Hamilton				×				
Galeopsis Tetrahit L.				×				
Lycopus americanus Muhl.		×						
Mentha arvensis L., var. glabrata (Benth.) Fernald		×	×	×			×	
SCROPHULARIACEAE								
Veronica americana Schwein.				×				
scutellata L.		×						
humifusa Dickson				×			×	
Castilleja pallida (L.) Spreng., var. septentrionalis (Lindl.) Gray		×	×			×		×
Pedicularis groenlandica Retz.				×	×	×		

	1	2	3	4	5	6	7	8
LENTIBULARIACEAE								
Utricularia vulgaris L., var. americana Gray								×
Pinguicula vulgaris L.	×		×					
PLANTAGINACEAE								
Plantago major L.	×	×		×			×	
major, var. intermedia (Gilibert) Dene.		×						
juncoides Lam., var. decipiens (Barneoud) Fernald			×			×		×
oliganthos R. & S., var. fallax Fernald			×			×		
RUBIACEAE								
Galium Aparine L.		×						
boreale L.	×	×						
labradoricum Wieg.			×	×	×			×
asprellum Michx.		×					×	
triflorum Michx.		×					×	
CAPRIFOLIACEAE								
Lonicera villosa (Michx.) R. & S., var. typica Fernald				×			×	
involucrata (Richards.) Banks		×						
Linnaea borealis L., var. americana (Forbes) Rehder	×	×	×	×			×	
Viburnum pauciflorum Raf.	×	×	×			×	×	×
CAMPANULACEAE								
Campanula rotundifolia L.	×		×					×
COMPOSITAE								
Eupatorium maculatum L.		×						
Solidago macrophylla Pursh							×	
uliginosa Nutt.	×	×		×	×			×
graminifolia (L.) Salisb.								×
lepida DC.		×						
Aster longifolius Lam.	×	×						
Erigeron hyssopifolius Michx.	×	×						
philadelphicus L.	×	×		×				×
Antennaria appendiculata Fernald			×					
pulcherrima (Hook.) Greene	×		×		×			×
Achillea lanulosa Nutt.	×	×	×	×	×	×	×	×
Chrysanthemum arcticum L.			×			×		
Tanacetum huronense Nutt.			×					
Artemisia canadensis Michx.								×
borealis Pall., var. Purshii Bess.			×			×		×
candicans Rydb.			×					×
Petasites palmatus (Ait.) Gray		×						
sagittatus (Pursh) Gray						×		
Senecio palustris (L.) Hook								×
aureus L.	×	×						
pauperculus Michx.								×
Cirsium arvense (L.) Scop.		×		×				
Lactuca pulchella (Pursh) DC.		×						×
Prenanthes racemosa Michx.			×			×		×

Clark University,
Worcester, Massachusetts

DRABA IN TEMPERATE NORTHEASTERN AMERICA

M. L. Fernald

(*Continned from page 261*)

1. Draba alpina L. *Densely cespitose*, the caudex forming several crowded crowns *with masses of dead marcescent foliage* below the living rosette: *leaves* flat, elliptic-lanceolate, oblanceolate or narrowly oblong, obtuse to subacute, *entire or nearly so*, 0.7–2 cm. long, 2–5 mm. wide, *glabrous or more or less pubescent with simple or forking trichomes* on one or both surfaces, *conspicuously villous-ciliate with simple trichomes about* 1 *mm. long*, rarely with forking hairs intermixed: flowering stem a *naked scape*, rarely with a leafy bract subtending the lowest flower, 3–15 (rarely –20) cm. high, *hispid with simple and forking trichomes; raceme* at first corymbiform, *in fruit corymbose-racemose*, 4–20-flowered: *rachis and* slender *pedicels* (up to 1 cm. long) *copiously villous-hirsute; sepals oblong to oblong-ovate, rounded at summit*, 1.5–3 *mm. long, more or less villous: petals yellow*, obovate, shallowly emarginate, 3.5–5.5 *mm. long*, 2.5–4 *mm. broad: anthers* 0.5–0.7 *mm. long:* ovary glabrous or sparsely hispid; style 0.5–0.7 mm. long; siliques narrowly to broadly ovate, elliptic or oblong, 4–9 mm. long, 2–4 mm. broad, glabrous or sparsely hispid, with 12–20 *seeds* 1.3–1.5 *mm. long*.—Sp. Pl. ii. 642 (1753); O. E. Schulz in Engler, Pflanzenr. iv[105]. 84, fig. 8 (1927); Elis. Ekm. Svensk Bot. Tidskr. xxv. 479 (1931).—Arctic and subarctic regions, south on calcareous areas to Hudson Strait and the northern shores of Hudson Bay; northern Eurasia. Labrador: Ekortiarsuk, Cape Chidley, *C. Schmitt*, no. 289; crevices of rock, Cape Chidley, August 6, 1884, *R. Bell*. Ungava: Port Burwell, Hudson Strait, *J. M. Macoun*, no. 79,069, *Malte*, no. 119,988. Plate 290, figs. 1–4; map 1.

Var. nana Hook. *Leaves with* numerous *long* and simple or variously forking *trichomes on the surfaces*, 0.3–1 *cm. long:* scapes 0.5–7 cm. high.—Trans. Linn. Soc. xiv. 363 (1825). *D. Bellii* Holm in Fedde, Repert. iii. 338 (1907); Macoun, Geol. Surv. Can. t. 1 (date unknown); Payson, Am. Journ. Bot. iv. 261 (1917); Elis. Ekm. Svensk Bot. Tidskr. xxv. 469 (1931). *D. alpina*, var. *Bellii* (Holm) O. E. Schulz in Engler, Pflanzenr. iv[105]. 89 (1927).—

Map 1. Range in eastern America of Arnica alpina.

Arctic regions, south to Hudson Strait. Ungava: Port Burwell, Hudson Strait, *J. M. Macoun*, no. 79,072 (mixed with *D. fladnizensis*, var. *heterotricha*); crevices of rocks, Mansfield Island, August 30, 1884, *R. Bell*. Plate 290, figs. 5–7.

I am not convinced by the treatments of either the late Dr. Payson or of Mrs. Ekman that *Draba Bellii* is a species distinct from *D. alpina*. It seems to me an extreme arctic development, with the regular reduction in size and the increase of trichomes which one would expect under most xerophytic conditions. The beautiful series of plants collected by Dr. W. Elmer Ekblaw on the Crocker Land Expedition of 1913–16 in northwestern Greenland contains quantities of material bearing out this interpretation. It is also significant that on the sheet of the isotype of *D. Bellii* in the Gray Herbarium the late Professor Ostenfeld, who certainly understood *Draba* in the Arctic better than most botanists, wrote "only *D. alpina*."

Numerous names have been proposed for the dwarf arctic extreme and Schulz recognizes in arctic and subarctic America the following, besides typical *D. alpina:* var. *nana* Hook., which he makes include var. *glacialis* Th. M. Fries (1869), not other authors; var. *Adamsii* (Ledeb.) O. E. Schulz, based upon *D. Adamsii* Ledeb. (1842), which Mrs. Ekman, l. c. 466, has identified, by comparison with the types, with the wholly different *D. micropetala* Hook. (1825); var. *Pohlei* O. E. Schulz, cited from Cape Chidley, and differing only in its narrow siliques (2–2.5 mm. wide); var. *Bellii* (above discussed); var. *corymbosa* (R. Br.) Durand (1856), based on *D. corymbosa* R. Br. (1819), which, as Mrs. Ekman has shown (l. c. 493), was based on the identical type of *Cochlearia fenestrata* R. Br. to which genus and species *D. corymbosa* actually belongs; and var. *pilosa* (Adams) Regel, based on *D. pilosa* Adams, the type of which, according to Mrs. Ekman (l. c. 484) is a wholly different plant from any form of *D. alpina*, with "linear, carinate leaves, which are keeled on the underside and ciliate in long, hispid, simple hairs. The upper part of the stalk is glabrous like the pedicels" etc.

For our dwarf extreme of *Draba alpina* the name var. *nana* Hook. seems safe, at least.

2. D. fladnizensis Wulfen, var. heterotricha (Lindblom) Ball. Loosely to densely *cespitose*, the many branches and branchlets of the *caudex* closely *invested below* the living rosettes *with* pale, marcescent *subulate midribs* of former leaves: *leaves* oblanceolate, thin, 0.5–

1.5 cm. long, 1.5–4 mm. wide, entire or sparingly toothed, *with firm and finally prominent midrib, ciliate* with simple or bifurcate trichomes, *the surfaces glabrous except for simple, forking and stellate pubescence toward the tips of the expanding leaves: flowering stems* very slender, *filiform, scapose,* very rarely with a small leaf, *glabrous* or sparsely hirtellous, 1–10 cm. high: raceme at first corymbiform, becoming short-racemose, with mature rachis 0.5–4 cm. long, 2–13-flowered: flowering pedicels up to 6 mm. long: *sepals oblong, rounded at summit,* 2–2.5 mm. long, 1.2–1.8 *mm. broad, sparsely hirsute or glabrous: petals white,* obovate, emarginate, 3.5–5 *mm. long,* 2–3.5 *mm. broad: anthers* 0.5 *mm. long:* ovary glabrous, with a very short style; *siliques oblong to narrowly ovate,* 5–10 *mm. long,* 2–3.5 *mm. broad,* glabrous, *only obscurely or scarcely reticulate; septum without median fold* or with slight basal fold: *seeds* 16–20, often apiculate, 1–1.5 *mm. long.*—Bull. Soc. Bot. Fr. vii. 230 (1860). *D. lactea* Adams, Mém. Soc. Nat.Mosc. v. 104 (1817); DC. Syst. ii. 347 (1821) and Prodr. i. 170 (1824); O. E. Schulz in Engler, Pflanzenr. iv[105]. 261, fig. 25, H–L (1927). *D. androsacea* Wahlenb. Fl. Lapp. 174, t. 11, fig. 5 (1812) and various Am. auth., not Willd. (1800). *D. Wahlenbergii* Hartm. Handb. Skand. Fl. 249 (1820) and many later authors. *D. lapponica* DC. Syst. ii. 344 (1821) and many later authors. *D. Wahlenbergii,* β. *heterotricha* Lindbl. Linnaea, xiii. 324 (1839). *D. fladnizensis* Wats. in Gray, Syn. Fl. N. A. i[1]. 109 (1895) and other Am. auth. in part, not Wulfen (1778). *D. fladnizensis* **lactea* (Adams) and **lapponica* (Willd.) Dahl in Blytt, Haandb. Norges Fl. ed. Dahl, 382 (1906).—Arctic regions, south to the Torngat region of Labrador, Hudson Bay and the Canadian Rocky Mts.; northern Eurasia. LABRADOR: on slaty talus slope, Rowsell Harbor, lat. 58° 58′, *Abbe & Odell,* no. 373; moist, mossy, northern face of Ridge (ca. 320 m.) extending south from East Bay, Ikordlearsuk, lat. 59° 55′, *Abbe & Odell,* no. 382; steep, wet, cold bank of "K" River, Kangalaksiorvik, lat. 59° 18′, *Abbe,* no. 375; spur on southwest side (1140 m.), Mount Tetragona, lat. 59° 18′, *Abbe,* no. 379; lower slopes, north side of Komaktorvik, lat. 59° 16′, *Abbe,* no. 376; top of ridge north of harbor, Razorback Harbor, lat. 59° 14′, *Abbe,* no. 384; scree slide from top of Precipice Ridge to Komaktorvik Lake, lat. 59° 12′, *Abbe,* nos. 380, 381; on granitic rock, North Shore of Duck Bight, north of Ryan's Bay, *Woodworth,* no. 239: Okkak, *Moravian Bros.;* Ramah, *A. Stecker,* no. 212x; East Summit of Bishop's Mitre, lat. 57° 56′, *Abbe,* no. 386; West Summit of Bishop's Mitre, *Abbe,* no. 387. UNGAVA: Port

Map 2. Southeastern Extension in America of DRABA FLADNIZENSIS, var. HETEROTRICHA.

Burwell, Hudson Strait, *J. M. Macoun*, no. 79,072 (mixed with *D. alpina*, var. *nana*), *Malte*, nos. 120,038, 120,062, 120,136, 120,136a. PLATE 291; MAP 2.

Although some recent European authors keep *Draba lactea* Adams (*D. Wahlenbergii* Hartm.) apart as a species from *D. fladnizensis*, it is significant that the characters relied upon are not of the first importance. Lange, Ostenfeld and numerous others have united them and in Hultén's Flora of Kamtchatka, where *Draba* was worked up by Mrs. Ekman, she says of *D. lactea:*

> These specimens from Kamtchatka have some simple hairs even on the surface of the leaves and seem like most Siberian material somewhat infected with *D. fladnizensis* WULF.
>
> *D. lactea* ADAMS has been identified by SCHULZ with *D. Wahlenbergii* HARTM. and *D. lapponica* DC. This identification is probably right, as the specimens in Herb. DE CANDOLLE given to DC. by STEVENS and FISCHER belong to these species, ...
>
> From the diagnosis of ADAMS (loc. cit.) [of *D. lactea*] one must also conclude that *D. fladnizensis* is meant. ADAMS thus describes the leaves as "superne fere glabra subtus et ad marginem pilis simplicibus hispida" and mentions nothing about the stellate hairs that are characteristic of *D. Wahlenbergii*. This contradiction between the diagnosis and the second-type plants can only be explained under the assumption that, when making the diagnosis, ADAMS has had in view such impure, somewhat intermediate specimens as these here mentioned from Kamtchatka.[1]

Since, as would appear from the above and numerous other published items, much of the Siberian (as well as Arctic) material is transitional from *D. fladnizensis* to *D. lactea* and since all the Kamtchatkan material is called *D. lactea* "somewhat infected by *D. fladnizensis*," although the latter is not known from Kamtchatka, I find myself beyond my depth in attempting to separate them as species. Further doubt of the specific distinctions of *D. fladnizensis* and *D. lactea* is encountered in Schulz's treatment of the Gaspé plant. The only relative of *D. fladnizensis* in southeastern Quebec is a common, densely matted species (PLATE 292) of the Shickshock Mountains, with strictly glabrous leaves, very narrow sepals and petals, lance-acuminate siliques mostly 4 or 5 mm. long and only 1–2 mm. wide, septum with a conspicuous and broad median flange, seeds only 10–16 in number: in other words a plant quite different from either *D. fladnizensis* or *D. lactea*. Nevertheless, upon one collection of this completely isolated and endemic Shickshock species Schulz extends *D. lactea* to Gaspé: "Lower Canada: Table-Topped Mts., Gaspé Co. (J. A. Allen 1881)." Upon another collection of the same plant he

[1] Elis. Ekm. in Hultén, Fl. Kamtch. ii. 163 (1928).

DRABA ALPINA: FIG. 1, flowering plant, × 1, from Norway; FIG. 2, small fruiting plant, × 1, from Torne Lappmark; FIG. 3, portion of rosette, × 10, from fig. 2; FIG. 4, summit of scape, × 10, from fig. 2.

D. ALPINA, var. NANA: FIG. 5, fruiting plant, × 1, from Mansfield Island, Hudson Bay (isotype of *D. Bellii*); FIG. 6, flowering plant, × 1, from Thule, northwest Greenland; FIG. 7, leaves, × 10, from fig. 6.

DRABA FLADNIZENSIS, var. HETEROTRICHA: FIG. 1, small flowering plant, × 1, from Thule, northwest Greenland; FIG. 2, fruiting plant, × 1, from Labrador; FIG. 3, tips of leaves, × 10, from fig. 1; FIGS. 4 and 5, valve and septum, × 10, from Torne Lappmark.

DRABA ALLENII, n. sp.: FIG. 1, portion of flowering plant, × 1; FIG. 2, portion of fruiting plant, × 1; FIG. 3, leaves, × 10; FIG. 4, flowers, × 10; FIGS. 5 and 6, valve and septum, × 10; all from Shickshock Mts., Quebec.

DRABA RUPESTRIS: FIG. 1, small flowering plant, × 1, from type locality, Ben Lawers, Scotland; FIG. 2, fruiting plant, × 1, from Newfoundland; FIG. 3, flowering plant, × 1, from Labrador; FIG. 4, leaves, × 10, from fig. 2.

DRABA CRASSIFOLIA: FIG. 1, small flowering plants, × 1, from original collection of Drummond; FIG. 2, flowering and fruiting plants from Labrador; FIGS. 3 and 4, fruiting and flowering plants from Greenland, × 1; FIG. 5, leaf and base of scape, × 10, from fig. 2; FIG. 6, flower, × 10, from fig. 4.

DRABA NIVALIS: FIG. 1, flowering plant, × 1, from Greenland; FIG. 2, fruiting plant, × 1, from Greenland; FIG. 3, leaves, × 10, from Newfoundland.

D. PEASEI, n. sp.: FIG. 4, fruiting plant (TYPE), × 1, from Gaspé Co., Quebec; FIG. 5, tips of leaves, × 10, from the TYPE; FIG. 6, valve, × 10, from the TYPE; FIG. 7, septum and seeds, × 10, from the TYPE.

DRABA AUREA: FIG. 1, small flowering plant, × 1, from Greenland; FIG. 2, small fruiting plant, × 1, from Greenland; FIG. 3, fruiting plant, × 1, from Alberta.

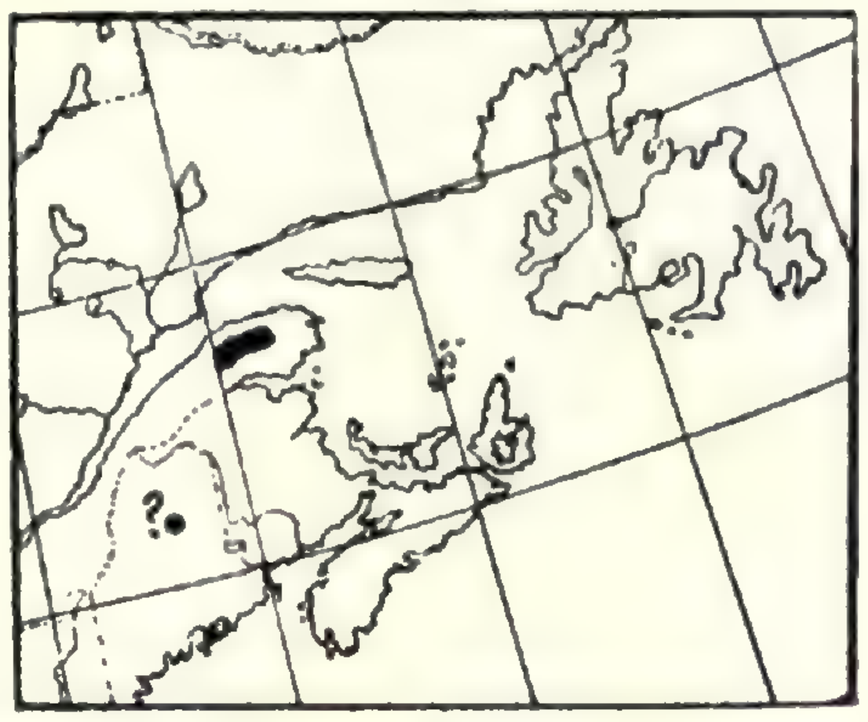
DRABA MINGANENSIS, n. sp.: FIGS. 1, 2 and 3, small flowering plants, × 1, from Archipel de Mingan, Quebec (isotypes of *D. luteola*, var. *minganensis*); FIG. 4, flower, × 10, from fig. 1; FIG. 5, small fruiting plant, × 1, from Bic, Quebec.

D. LUTEOLA: FIG. 6, fruiting plant, × 1, from Colorado; FIG. 7, silique, × 10, from fig. 6.

DRABA MINGANENSIS: FIG. 1, well developed fruiting plant, × 1, from Bic, Quebec; FIGS. 2 and 3, flowers and tip of silique, × 10, from Bic.

bases his single record of the strictly Eurasian *D. fladnizensis* for all North America: "K a n a d a: Quebec, Matane Co., Mt. Mattaouisse, Südseite des Fernald Passes, 915–1000 m ü. M. (M. L. F e r n a l d, L u d l o w G r i s c o m, K. K. M a c k e n z i e, A. S. P e a s e, L. B. S m i t h 1923, n. 25779, hb. Deless.)"—Schulz, p. 257. If the uniform and wholly isolated Gaspé plant is both *D. lactea* and *D. fladnizensis* (which it is not), it would seem that fuller demonstration is needed before *D. lactea* and *D. fladnizensis* are accepted as distinct species. The Malte collections from Hudson Strait have been identified by Mrs. Ekman as *D. lactea* and as *D. lactea* crossed with various other species (*D. nivalis*, *D. rupestris*, etc.). See comments on p. 250.

3. D. **Allenii**, sp. nov. (TAB. 292), planta valde humifusa stragula 0.3–2 dm. diametro formans; caudiculorum ramis ramulisque filiformibus albescentibus confertis, inferne nervis mediis foliorum emortuorum persistentibus subulatis albidis nitidulis squamatis, superne foliis rosulatis cespitem laxum 0.5–2 dm. diametro formantibus; foliis tenuibus oblanceolatis 0.5–1.5 cm. longis 1–3 mm. latis subacutis integris vel subintegris enascentibus margine pilis simplicibus 0.2–0.5 mm. longis erectis deinde deciduis raro ciliatis caeterum glabris nerviis mediis subtus prominentibus; caulibus filiformibus simplicibus scapiformibus vel raro imo folio unico praeditis glabris nitidis 1–8 cm. altis; racemis floriferis confertis fructiferis parum elongatis (rhachi 0.2–2.5 cm. longo) 2–8-floris; pedicellis imis fructiferis 1.5–5.5 mm. longis; sepalis anguste oblongis 1.2–2 mm. longis 0.5–1 mm. l a t i s submembranaceis glabris; petalis lacteis obovatis emarginatis 2–3 mm. longis 1–2 mm. latis; antheris 0.2 mm. longis; ovariis glabris 10–16-ovulatis; siliculis glabris oblongo-lanceolatis acutis vel acuminatis 2.7–7 mm. longis 1–2 mm. latis stylo 0.2–0.6 mm. longo coronatis, valvis reticulato-nervosis, septi medio valde plicato; seminibus a funiculis 0.2–0.5 mm. longis pendulis ovoideis brunneis 0.7–1.1 mm. longis.—Alpine areas of the Schickshock Mountains, Gaspé and Matane Cos., QUEBEC: on rock, at about 915 m. (3000 ft.), Table-topped Mountain, August 10, 1881, *J. A. Allen* (distributed as *D. androsacea*); abrupt, western calcareous slopes, alt. 1000–1100 m., Table-topped Mt., August 5, 1906, *Fernald & Collins*, no. 226 (distributed as *D. corymbosa*); calcareous cliffs, facing north, alt. 900–



Map 3. Range of DRABA ALLENII.

1125 m., Table-topped Mt., August 7, 1906, *Fernald & Collins*, no. 581; mossy hornblende-schist at about 915 m. (3000 ft.) near eastern end of the basin, northeastern slope of "Mt. Logan" [later determined to be Mt. Mattaouisse], July 22, 1922, *Fernald & Pease*, nos. 25,097, 25,101, 25,102; cold chimneys and rock-shelves at about 915–1000 m. alt., south side of Fernald Pass, Mt. Mattaouisse, July 8, 1923, *Fernald, Griscom, Mackenzie, Pease & Smith*, no. 25,779 (TYPE in Gray Herb.); cold schistose walls at head (alt. about 1070 m.) of Big Chimney, Mt. Mattaouisse, July 14, 1923, *Fernald, Griscom, Pease & Smith*, no. 25,783; boggy openings in Fernald Pass, alt. about 885 m., between Mts. Mattaouisse and Fortin, August 20, 1923, *Fernald & Smith*, no. 27,780; moist turfy chimneys at about 850–1000 m. alt., southern slope of Mt. Fortin, July 12, 1923, *Fernald, Griscom & Mackenzie*, no. 25,781; gravelly and turfy slides and chimneys at about 850–1000 m. alt., in the steep schistose southern face of Mt. Fortin, August 21, 1923, *Fernald & Smith*, no. 25,784; cold, mossy chimneys (alt. about 800–1050 m.) at head of Pease Basin, between Mts. Logan and Pembroke, July 13, 1923, *Fernald, Griscom, Mackenzie, Pease & Smith*, no. 25,782. All distributed, unless otherwise noted, as *D. fladnizensis*. MAP 3.

Draba Allenii, like *Ranunculus Allenii* Robinson, commemorates the pioneer botanical explorations of the Shickshock Mts. by JOHN ALPHEUS ALLEN, 1863–1916. Although obviously related to *D. fladnizensis* Wulfen and *D. fladnizensis*, var. *heterotricha* (Lindbl.) Ball (*D. lactea* Adams; *D. Wahlenbergii* Hartm.), PLATE 291, it differs from them both in important characters. Schulz, as noted in the discussion of *D. fladnizensis*, var. *heterotricha*, cites the two specimens of *D. Allenii* which had come to his attention, one as the only basis in North America of *D. fladnizensis*, as var. *laxior* (Gaudin) O. E. Schulz, based on *D. sclerophylla* Gaud., β. *laxior* Gaudin; the other as the only eastern Canadian representative of *D. lactea*.

Whether *D. sclerophylla*, β. *laxior* Gaudin is properly referable to *D. fladnizensis* is a question for students of the alpine flora of Europe to determine; but from *D. Allenii* it is very definitely distinguished by the following points specially noted in Gaudin's original and very detailed description: "R o s u l a e sessiles, densissime caespitosae, aggregatae et quasi confluentes" (in *D. Allenii* the rosettes terminating loosely elongate caudices and themselves very lax); "F o l i a . . . dura, . . . lineari-ligulata, . . . obsolete uninervia, . . . pilis mere marginalibus, rigidis" (in *D. Allenii* leaves thin and membranaceous, oblanceolate, very prominently costate beneath, mostly eciliate, but rarely with a few flexuous cilia); "F l o r e s . . . per exsiccationem ochroleuci" (in *D. Allenii* with no

obvious yellow after 10–12 years); "S i l i c u l a e . . . pedunculum aequantes, . . . ovales, . . . s t i g m a t e sessili" (in *D. Allenii* siliques much shorter than pedicels, lance-acuminate, with definite style). In general one does not expect in Gaspé local plants of the Swiss Alps, unless they have been found to have a broad circumpolar dispersal; and Schulz's account of his *D. fladnizensis*, var. *laxior* contains a point not mentioned by Gaudin, which is inconsistent with *D. Allenii* being the European plant: "Pedicelli . . . , inferiores (1–2) saepe ex axilla folii prodeuntes" (never in *D. Allenii*).

Draba fladnizensis, as shown in the original plate and in other excellent illustrations as well as in specimens from the Tirol and from the Rhaetic Alps and other continental European mountains, is, as well described by Schulz, a densely cespitose plant, with closely crowded short crowns, the oblong leaves very conspicuously and permanently ciliate with long stiff divergent trichomes, the siliques ellipsoid or oblong, obtuse, with valves scarcely reticulate, the septum without a long fold, the seeds 12–20. *D. Allenii* in its humifuse habit, with elongate freely forking filiform caudices, its leaves, when rarely ciliate, with few short, soft and erect (not divergent) cilia, its lance-acuminate or acute siliques with distinctly veiny valves, strong longitudinal fold of the septum and fewer seeds, is abundantly distinct.

Whether or not *Draba lactea* (PLATE 291) is maintained as a species or is treated as a variety (var. *heterotricha*) of *D. fladnizensis*, it has little in common with *D. Allenii:* cespitose habit; coarsely ciliate and variously pubescent leaves; much larger flowers; oblong to narrowly ovate siliques averaging twice as large as in *D. Allenii* and with veinless valves, plane septum and more numerous and larger seeds.

Draba Allenii is presumably on Mt. Katahdin, Maine. On September 21, 1926, Dr. G. L. Stebbins, jr. found at 4000 feet in the Chimney of Mt. Katahdin two plants of a strange Draba. Dr. Stebbins's published memorandum follows:

> While looking at the plants of *Saxifraga Aizoon* L. in the chimney, I noticed among them two plants of a Draba which I did not recognize, and which did not correspond to any of the Drabas described in Gray's Manual. Although I searched the surrounding rocks, I failed to find more than two plants, so I dared to take only a stalk with the seed pods. When I showed this to Professor Fernald, he identified it as *Draba fladnizensis* Wulfen, an arctic-alpine species which had not been found before south of the Shickshock Mountains of Quebec, and is therefore new to New England. Although both the Draba and the Saxifrage are normally

lime-loving, they were growing here on granite rocks in an acid soil region, and seemed quite healthy. There may be a little rich pocket in that particular spot, and it would certainly be interesting to find the soil reaction there.[1]

Under date of January 6, 1934, Dr. Stebbins writes: "I have visited the spot where I found them three times since, and in each case as diligent search as I was able to make failed to reveal the two plants or any others. I have, of course, been very much on the lookout for it on other parts of the mountain, but it hasn't turned up yet. The only hope for a real stand of it is in a narrow ravine that branches off the chimney to the right at its base, and looks wicked for climbing, though I have no doubt that the same band of softer, presumably more calcareous rock traverses it that is found in the chimney itself, which harbors quite a little *Saxifraga Aizoon*, and where I found the two plants mentioned."[2]

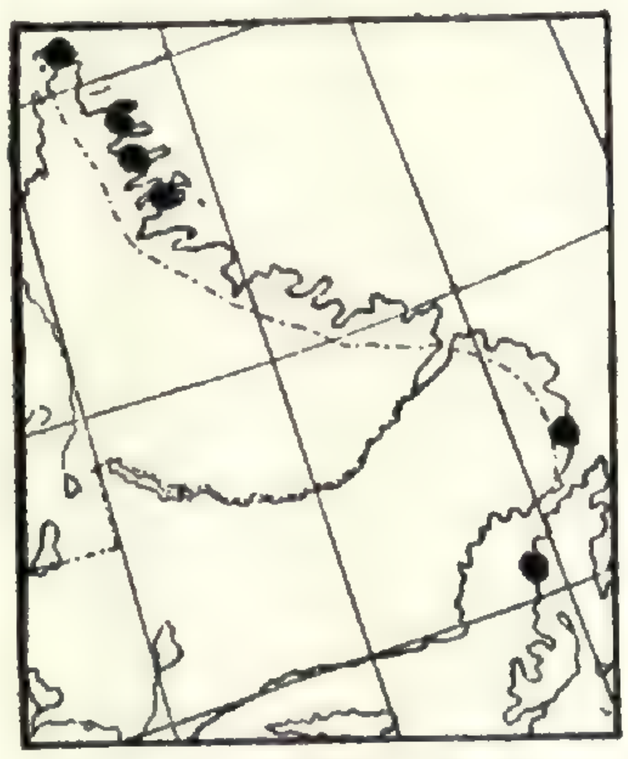
The much denuded fruiting raceme (with the valves gone) which Dr. Stebbins brought back seems to be that of *Draba Allenii*. Without seeing the foliage, however, it would be unwise to identify it with positiveness.

4. D. RUPESTRIS R. Br. Densely to loosely *cespitose, the multicipal caudex* with the short branches *retaining marcescent leaves or their shreds* and terminating in rosettes: *leaves* membranaceous, *linear-oblanceolate to oblong*, acutish, 5–15 mm. long, 1–3.3 *mm. broad*, 2–4-toothed or entire, *hispid with simple or variously forking trichomes, the midrib delicate and evanescent: flowering stem capillary, naked* (or rarely with 1–3 small leaves), 1–11 (–"25," *Ekm.*) cm. high, *hirtellous* with simple and forking trichomes or rarely glabrous: raceme during anthesis corymbose, in fruit elongating and with rachis up to 6 cm. long, 3–20-flowered; *pedicels hirtellous* with simple or forking trichomes, in maturity 1–4 mm. long; *sepals* narrowly oblong, 1.5 *mm. long, hirtellous:* petals white, obovate, 2.5–4 mm. long: ovary glabrous or hirtellous with simple and forking trichomes, 12–30-ovuled; *siliques on suberect or strongly ascending short pedicels, oblong*, 3–8 *mm. long, hirtellous* with simple or forking trichomes or glabrous (var. LEIOCARPA O. E. Schulz), with very short style: seeds oval,

[1] G. L. Stebbins, jr., RHODORA, xxix. 15, 16 (1927).

[2] Dr. E. T. Wherry, reporting on soil from the base of the *Saxifraga Aizoon* from Mt. Katahdin, "found it to be exactly neutral. The lime producing this condition in the soil may have come from a local concentration of calcium minerals in the granite—which is well known to occur elsewhere in Maine, especially on Mt. Desert Island—or may have been set free by unusually thorough decomposition of the humus at this point. The thing most difficult to account for would seem to be the manner in which the seeds of these circumneutral soil species managed to 'find' this favorable spot in the middle of a vast area of soils too acid to permit the plants to thrive.—Wherry, RHODORA, xxix. 139, 140 (1927).

brown, 1–1.3 mm. long.—R. Br. in Hort. Kew. ed. 2. iv. 91 (1812); DC. Syst. ii. 344 (1821) and Prodr. i. 169 (1824); Elis. Ekm. Kungl. Svenska Vet.-Akad. Handl. ser. 3, lvii. no. 3: 53, t. 3, figs. *h* and *o* (1917); O. E. Schulz in Engler, Pflanzenr. iv[105]. 223 (1927). *D. hirta* Sm. Fl. Brit. ii. 677 (1800) and Engl. Bot. xix. t. 1338 (1804), not L. (1759). *D. hirta*, γ *rupestris* (R. Br.) Wahlenb. Fl. Suec. 399 (1824).—Northern Europe, Greenland, Labrador, Ungava and Newfoundland, very local. LABRADOR: Ramah, July 15–August 20, 1894, *A. Stecker* (distributed as *D. hirta*, var. *arctica*); Eastward side of East Summit of Bishop's Mitre, lat. 57° 56′, August 21, 1931, *Abbe*, no. 385; Okkak, *Weitz* (Brit. Mus.); Battle Harbor, August 3, 1913, *W. E. Ekblaw*. UNGAVA: crevices of rock, Cape Chudleigh, *R. Bell*, no. 2027. NEWFOUNDLAND: limestone barren, near sea-level, Pointe Riche, August 4, 1910, *Fernald, Wiegand & Kittredge*, no. 3455, siliques glabrous = var. LEIOCARPA O. E. Schulz, l. c. 224 (1927). PLATE 293; MAP 4.



Map 4. Eastern American Range of DRABA RUPESTRIS.

Draba rupestris is obviously very rare in eastern America. The plants cited are fair matches for material from the type station, Ben Lawers (FIG. 1). Most of the plants, common in western and northern Newfoundland, with a marked variety in Gaspé, which have been passing as *D. rupestris* are better referred to the coarser and usually more leafy *D. norvegica* Gunner. Should it prove on further observation, as seems not unlikely, that *D. rupestris* and *D. norvegica* are confluent, the earliest name, *D. norvegica* Gunner (1772), should be used for both. I am here maintaining *D. rupestris* out of deference to the opinion of European students, although I expect that further study in the field will demonstrate it to be only an extreme phase of *D. norvegica*.

5. D. CRASSIFOLIA Graham. *Short-lived perennial* (biennial or annual ?) with simple or slightly branching caudex forming solitary rosettes or mats up to 5 cm. broad, *glabrous throughout* or the leaves sometimes ciliate: *leaves somewhat fleshy, drying thin and subtranslucent*, oblanceolate, obtuse or subacute, entire or essentially so, 0.4–1.5 cm. long, 1.5–5 mm. broad, *glabrous* throughout *or frequently sparsely ciliate with simple* (rarely bifurcate) *trichomes* 0.5–1 *mm. long: scapes filiform*, including the raceme 1–10 cm. high, naked or rarely with 1 or 2 leaves, *glabrous: raceme* at first corymbiform, *elongating in fruit to* 1–7 *cm.*, 3 (rarely 1)–10-flowered, *the lower* 1–2 *flowers remote: pedicels* filiform, glabrous, *the lower in fruit becoming* 4–10

(rarely –22) *mm. long: sepals* oblong or oblong-elliptic, 1.5–2.3 *mm. long: petals yellow, drying whitish*, rarely white from the first, often purple-tinged, *narrowly spatulate-obovate to cuneate-oblanceolate*, emarginate, 2–3 mm. long, 0.7–1.2 *mm. wide:* anthers 0.2–0.3 mm. long: *ovary glabrous, with* 16–20 *ovules and sessile stigma: siliques* on spreading or arched-ascending pedicels, elliptic-lanceolate to oblong, *glabrous*, 3–9.5 mm. long, *capped by the sessile stigma;* the *valves scarcely nerved: seeds* 0.75–0.8 *mm. long*.—Edinb. New Phil. Journ. (Apr.–June, 1829), 182 (1829); Hook. Fl. Bor.-Am. i. 54 (1830); Torr. & Gray, Fl. N. Am. i. 106 (1838); Lange, Consp. Fl. Groenl. 38 (1880); Wats. in Gray, Synop. Fl. N. Am. i[1]. 108 (1895), mostly; Elis. Ekm. Kungl. Svenska Vet.-Akad. Handl. ser. 3, ii. no. 7: 32 (1926); O. E. Schulz in Engler, Pflanzenr. iv[105]. 325 (1927).—Greenland; Labrador; northernmost Ungava; Rocky Mountains of Alberta and British Columbia, south in alpine areas, very locally, to Colorado; Arctic Europe. LABRADOR: steep, wet cold bank of "K" River, Kangalaksiorvik, lat. 59° 18′, *Abbe*, no. 374: Ramah, *Sornborger*, no. 175 (mostly). UNGAVA: Port Burwell, Hudson Strait, *Malte*, no. 120,092. PLATE 294; MAP 5.

Map 5. Southeastern Extension in America of DRABA CRASSIFOLIA.

In western America passing into the following varieties:

Var. ALBERTINA (Greene) O. E. Schulz, l. c. 327 (1927). *D. albertina* Greene, Pittonia, iv. 312 (1901).—Leaves more or less pubescent with stellate as well as simple and bifurcate trichomes; the cilia often numerous and 0.7–1.3 mm. long; racemes up to 17-flowered.—Alberta and British Columbia to Colorado and California.

Var. PARRYI (Rydb.) O. E. Schulz, l. c. 327 (1927), as to type, but excluding Schulz's description and the Labrador plant. *D. Parryi* Rydb. Bull. Torr. Bot. Cl. xxix. 241 (1902).—Leaves linear-oblanceolate, 1–2.5 cm. long, 1–2.5 mm. wide, acutish, glabrous or ciliate only at base: flowering stems up to 1.6 dm. high, with racemes up to 25-flowered.—Colorado and Wyoming. PLATE 300, FIGS. 4 and 5.

Although *Draba crassifolia* is often said to be sometimes annual ("annual or biennial"—Watson; "Herba annua, dein perennans"—Schulz), I have seen few specimens which seem to be unquestionably annual; most of them have remnants of the last year's leaves below the fresh rosette. Those who have known the species best all treat it as perennial. Graham had before him the living plants which he had himself raised at Edinburgh from seeds "presented by Mr. Drummond in February 1828." These began flowering and fruiting

in 1829, and under date of "*10th June* 1829" Graham described his species: "Plant densely caespitose, perennial." That it is a perennial which begins flowering very promptly is, however, indecated by Graham's statement: "It flowers most freely, . . . produces abundance of seed, and has come up in many of the neighbouring pots in the Edinburgh Botanic Garden without any change of character." If by the latter statement Graham meant that the cultivated plant had, in slightly more than one year, seeded, scattered its seeds and produced a second crop which had matured far enough to justify his saying "without any change of character," then, in cultivation in a temperate climate, *D. crassifolia* may evidently become annual. Mrs. Ekman, who seems to have studied the Greenland and European plants very thoroughly, says, "*Planta* saepe caespitosa." On the other hand, specimens of Drummond's original material (FIG. 1), which had once belonged to Jacques Gay but which are now in the Gray Herbarium, bear Gay's comment: "Févr. 1851. La plante est évidemment annuelle! Hooker et Asa Gray la classent à tort parmi les espèces vivaces."

Rydberg, in his Flora of the Rocky Mountains, ed. 2: 350, 353, reduces *D. albertina* Greene, without qualification, to *D. crassifolia* and he defines the latter as having "leaves oblanceolate to spatulate, hirsute" as contrasted with the "leaves narrowly linear-oblanceolate, glabrous" of his own *D. Parryi* (PLATE 300, FIGS. 4 and 5), which he maintains as a species.

In view of the doubts raised as to the duration of *Draba crassifolia* and by the definition of it by Rydberg as having the leaves hirsute, it has seemed desirable to examine Graham's own specimen. This, most happily, has been possible through the kindness of my good friend, the Regius Keeper of the Royal Botanic Garden at Edinburgh, Sir William Wright Smith (to whom I here reexpress my sincere appreciation); and I now have before me the original specimen preserved by Graham: "*Draba crassifolia* Graham, Hort. Bot. Edin. 1829. Seeds from Arctic America."[1] This is, as Graham himself stated, identical with Drummond's material (PLATE 294, FIG. 1).

[1] Drummond collected the plant, as shown on the label of one of his specimans in the Gray Herbarium (sent by Hooker, with whose specimens Graham's cultivated plant is identical) on "Summits of the Rocky Mountains between lat. 52° and 57°." The assumption, very general in the reports on botanical explorations in British America in the 1st half of the 19th century, that all points slightly north of the international boundary were "arctic" has led to endless confusion, by the citation, by Hooker and others, of plants growing from 52°–57° as coming from "Arctic America."

It is the northernmost extreme of the species adequately and clearly described by Graham with "*Leaves* (5 lines long, 2 broad), much crowded, subcarnose, smooth, veinless [when fresh, although clearly veiny by transmitted light when dry], indistinctly keeled, subdenticulate, rather sparingly ciliated with simple spreading hairs."

Rydberg's description of his *Draba Parryi* (which I am treating as a Colorado variety of *D. crassifolia*) was

> Annual, perfectly glabrous, except a few cilia on the petioles: stems several, usually less than 1 dm. high, scapiform or rarely with a stem leaf: basal leaves numerous, linear or narrowly linear-oblanceolate, 1.5–2.5 cm. long—; etc.

The Colorado material of var. *Parryi* (PLATE 300, FIGS. 4 and 5) has at most (so far as I have seen) about 24 seeds in a silique, the leaves are at most 2.5 mm. wide and the tallest stem seen is 1.6 dm. high. Schulz, however, in transferring *D. Parryi* to varietal rank, gives it a characterization so unlike that of Rydberg's species that it is apparent that he has confused something with it:

> Planta altior et ramosior, fructifera usque ad 20 cm longa. Caules interdum 3–4-phylli. Folia longiora, usque 3 cm longa. . . . Ovarium 24–36-ovultum. Pedicelli inferiores saepe valde elongati, usque 2, 5 cm longi.

Schulz, furthermore, begins his citation of specimens with Labrador; and of the tall (up to 2.5 dm.), branching, large-leaved (leaves 3–8 mm. broad), leafy-stemmed plant from Ramah (*Sornborger*, no. 61), which may have as many as 48 ovules and which has petals twice as large as in *D. Parryi*, he specially comments: "August fruchtend, besonders luxuriös mit beblätterten Ästen." Schulz's description of var. *Parryi* was, apparently, derived chiefly from the wholly distinct plant of Labrador (our no. 11, PLATE 300, FIGS. 1–3).

I have not seen the other Labrador specimens cited by Schulz under var. *Parryi;* they may be like the Sornborger material. It should be noted, however, that "Cumberland Inlet," cited under Labrador, is presumably the well-known Cumberland Sound of Baffin Island.

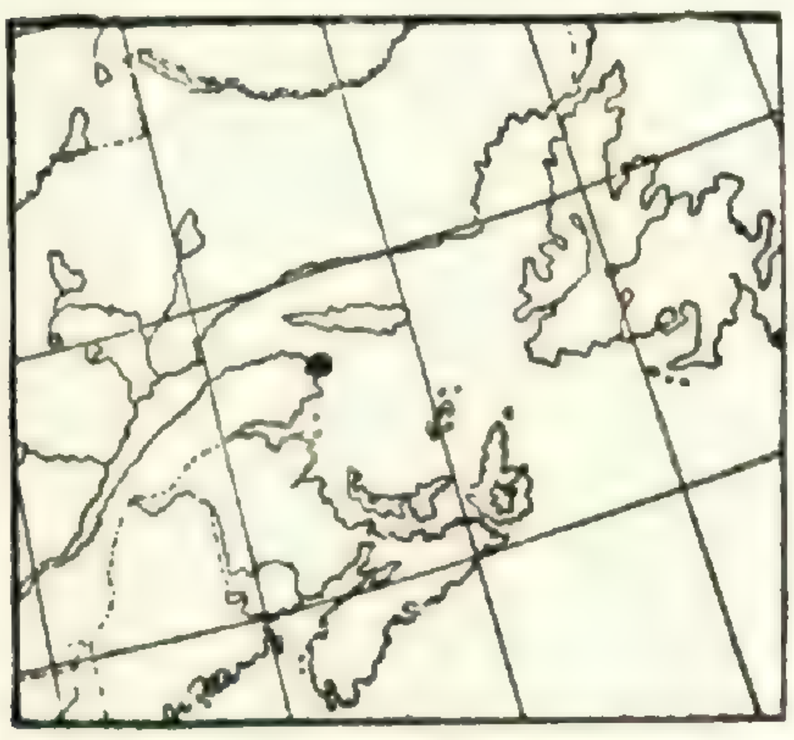
6. D. NIVALIS Liljebl. Densely to loosely *cespitose*, forming mats 1–10 cm. across; the branches of the multicipital *caudex* clothed *with marcescent shreds* of dead leaves and ending in compact *subglobose rosettes* 3–15 mm. in diameter: *leaves cuneate-obovate to broadly oblanceolate*, *obtuse*, entire or essentially so, *subcoriaceous*, 3–11 *mm. long*, 1–4.5 *mm. broad*, with the firm subulate midrib prominent beneath, the surfaces *canescent-pannose with minute* sessile or subsessile *stellate*

trichomes: flowering stem naked and scapose, very rarely with a single small leaf, filiform, 1–10 cm. high, *stellate-tomentulose:* raceme subcapitate at flowering, in fruit elongate into an open or lax raceme with rachis up to 6 cm. long, 1–13-flowered: pedicels stellate-tomentulose, very short in flower, elongating in fruit to 1–8 mm., then spreading or subascending: *sepals* narrowly oblong or narrowly ovate, 1.5–2 mm. long, *stellate-pilose; petals white*, cuneate-obovate, 2.5–3 *mm. long*, 1.2–2 mm. broad: anthers about 0.3 mm. long: ovary minutely stellate, 14–28-ovuled; *siliques* strongly flattened, lanceolate to narrowly oblong, *narrowed to the short* (0.1–0.4 *mm.*) *style, glabrous*, 4–9 mm. long, 1–2 mm. broad; *seeds* 14–28, 0.7–1 *mm. long*.—Vet.-Akad. Handl. (1793) 208 (1793), Utkast til Sv. Fl. ed. 2: 269, fig. 35 (1798) and Nov. Act. Reg. Soc. Sci. Ups. vi. 47, t. II, fig. 2 (1799); Watson in Gray, Syn. Fl. N. Am. i[1]. 109 (1895); Elis. Ekm. Kungl. Svenska Vet.-Akad. Handl. ser. 3, ii. no. 7: 26, t. II, figs. 2, 7, 8, 10, 13 and 16 (1926); O. E. Schulz in Engler, Pflanzenr. iv.[105]. 209 (1927); Elis. Ekm. Svensk Bot. Tidskr. xxvii. 339 (1933). *D. muricella* Wahlenb. Fl. Lapp. 174 (1812); Hook. Fl. Bor.-Am. i. 52 (1830); Torr. & Gr. Fl. N. Am. i. 104 (1838). *D. Liljebladii* Wallm. in Liljebl. Sv. Fl. ed. 3: 350 (1816). *D. stellata*, α. *nivalis* (Liljebl.) Regel, Bull. Soc. Nat. Mosc. xxxiv[2]. 192 (1861); Macoun, Cat. Can. Pl. i. 50 (1883).—Arctic regions and mts. of Eurasia and North America, south to the Straits of Belle Isle, Newfoundland, the Gaspé Peninsula, Quebec and shores of Hudson Bay. LABRADOR: talus slope, west side of the lower lake, Valley of the Bryant Lakes, Kangalaksiorvik, lat. 59° 23′, *Abbe*, no. 383; spur on southwest side (alt. 1140 m.), Mount Tetragona, lat. 59° 18′, *Abbe*, nos. 377, 378; Kangalaksiorvik Bay, September, 1908, *Owen Bryant;* on granitic rock, Head of Main Arm of Ekortiarsuk Bay, *Woodworth*, no. 240; margin of solid polygon, upper ridge (ca. 840 m.), Cape Mugford Peninsula, lat. 57° 50′, *Abbe*, no. 372; Okkak, *Moravian Brothers;* steep rocky hillside, Percoliak Island, Nain Bay, lat. 57°, *Harlow Bishop*, no. 324; Anatolak, *Sewall*, no. 516; Nain, *Lundberg* (Brit. Mus.); moist crevice near top of hill, Rodney Mundy Island, Indian Harbor, lat. 54° 27′, *Abbe & Hogg*, no. 369; rocky places, Dead Islands, lat. 52° 48′, July, 1882, *J. A. Allen.* UNGAVA: Port Burwell, Hudson Strait, *Malte*, nos. 120,098, 120,159. NEWFOUNDLAND: rocky crests, Cape Dégrat, Quirpon Island, *Fernald & Long*, nos. 28,344, 28,345; dry slaty crests of hills, Little Quirpon, *Fernald & Long*, no. 28,343; open

Map 6. Southeastern extension in America of DRABA NIVALIS.

peaty and gravelly spots on crests of trap cliffs, Cape Onion, *Fernald & Long*, no. 28,346; crevices of trap cliffs, Anse aux Sauvages, *Fernald, Wiegand & Long*, no. 28,347; gravelly shelves, crests and talus of diorite, Ha-Ha Mountain, *Pease & Griscom*, no. 28,342. QUEBEC: calcareous sea-cliffs and rock-slides by the Gulf of St. Lawrence, slightly west of Marten River, Gaspé Co., *Fernald & Pease*, no. 25,100; roches humides des falaises, Ruisseau Sorel, Gaspé Co., *Victorin, Rolland & Jacques*, no. 33,675; on bare hornblende-schist near the summit, about 1100 m. (3600 ft.) alt., Mt. Fortin, *Fernald & Pease*, no. 25,099; moist turfy chimneys at about 850–1000 m. alt., in steep schistose southern face of Mt. Fortin, *Fernald, Griscom & Mackenzie*, no. 25,786, *Fernald & Smith*, no. 25,788; cold chimneys and rock-slides at about 915–1000 m. alt., south side of Fernald Pass, Mt. Mattaouisse, *Fernald, Griscom, Mackenzie, Pease & Smith*, no. 25,785; cliffs and chimneys at about 800–1050 m. alt., east of Big Cascade, Pease Basin, between Mts. Logan and Pembroke, *Dodge & Pease*, no. 25,787. PLATE 295, FIGS. 1–3; MAP 6.

7. D. **Peasei**, sp. n. (TAB. 295, FIGS. 4–7), planta laxe cespitosa stragula 6 cm. diametro formans; caudiculorum ramis filiformibus albescentibus nitidis inferne foliis emortuis vix fibrillosis squamatis, superne foliis rosulatis cespitem laxum 6–13 mm. diametro formantibus; foliis linearibus vel lineari-oblanceolatis acutis crassis 3–6.5 mm. longis 1–1.5 mm. latis integris valde costatis utrinque laxe stellato-pannosis stellis 0.3–0.4 diametro, foliis maturis glabratis subcoriaceis nitidis; caulibus filiformibus scapiformibus 2 cm. altis stellato-hirtellis; floribus ignotis; racemis fructiferis parum elongatis (rhachi 1–2 cm. longo); pedicellis fructiferis stellato-hirtellis imis 4–6 mm. longis; siliquis stellato-hirtellis 3–6 ellipticis acutis 3–5.5 mm. longis 2–2.5 mm. latis stylo 0.8–1 mm. longo coronatis, valvis reticulato-nervosis; seminibus 1.2–1.8 mm. longis 4–5 in utroque loculo a funiculis 0.3–0.6 mm. longis pendulis.—QUEBEC: talus slope near Cape Rosier, Gaspé Co., July 18, 1928, *A. S. Pease*, no. 20,194 (TYPE in Gray Herb.). MAP 7.

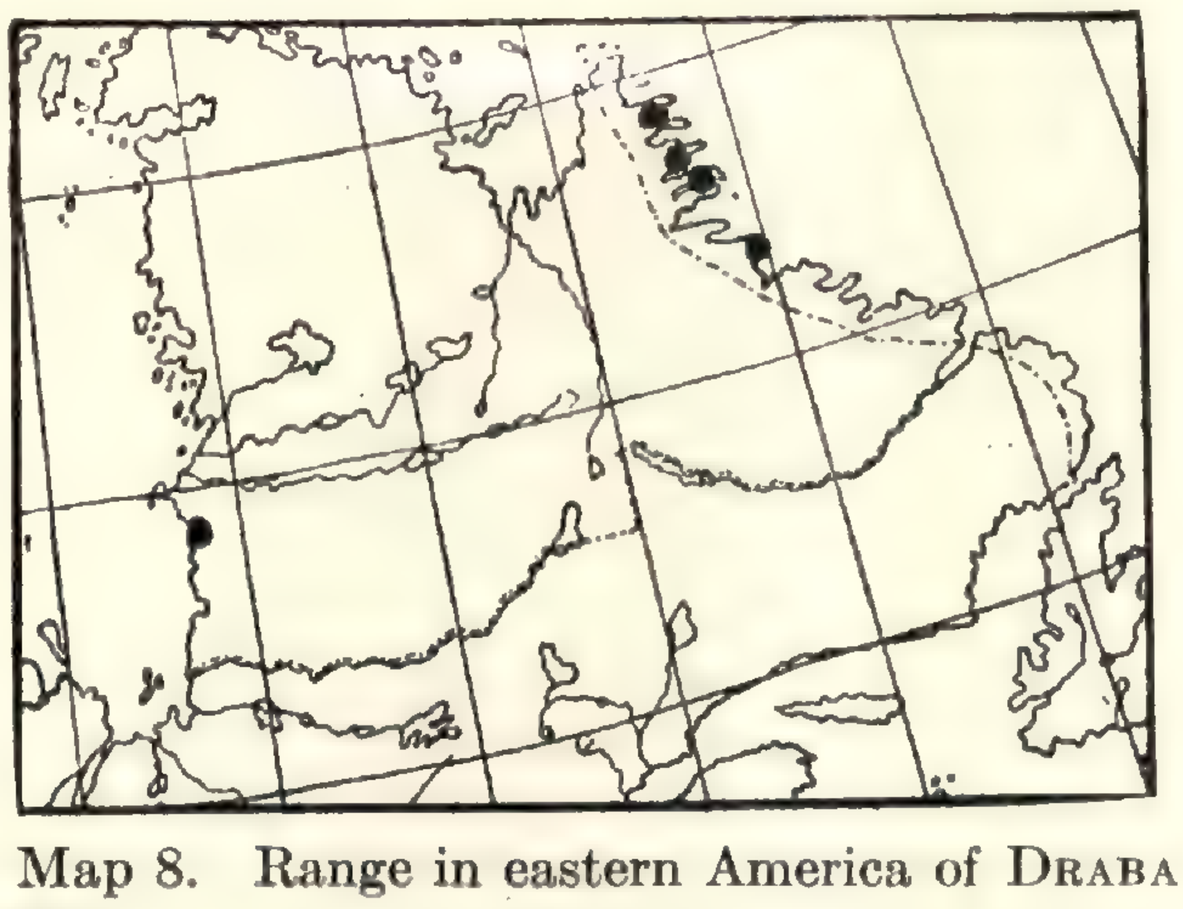


Map 7. Range of DRABA PEASEI.

Draba Peasei, with which it is a great pleasure to associate the name of its discoverer, ARTHUR STANLEY PEASE, distinguished classical scholar and keen amateur botanist, was at first identified by me as *D. oligosperma* Hook. of the Rocky Mountain region and under that name was reported by Pease, RHODORA, xxxi. 55 (1929). It is, however, quite distinct from *D. oligosperma* in several characters, although the few and very large seeds and the long style at once

suggest that species. But *D. oligosperma* has much narrower and rigid leaves with more pronounced keel, usually smoother scape, longer raceme, pedicels strongly thickened at summit, inequilateral siliques often subtended by marcescent sepals, the valves (when pubescent) bearing simple or bifurcate, rather than stellate trichomes. In its flattish leaves *D. Peasei* is nearer to *D. incerta* Payson, of the northern Rocky Mountains, but that likewise has the siliques with simpler pubescence (or glabrous), longer, and with a strongly marked inequilateral tendency and usually longer pedicels (lowest in maturity 5–15 mm. long). Fuller and younger material of *D. Peasei* is needed, especially in flower and younger fruit. Its cordilleran allies have yellow petals.

8. D. AUREA M. Vahl. *Short-lived* perennial, or perhaps sometimes biennial, the simple to several-crowned *caudex covered below with marcescent leaves and their hardened bases:* new *rosettes* 2–7 cm. broad; *their leaves* oblanceolate to narrowly spatulate-obovate, narrowed to petioles, entire or obscurely dentate, 1–3.5 cm. long, 2–7 mm. broad, *canescent-pilose* on both surfaces *with mixed simple, variously forking and stellate trichomes: flowering stems* simple to freely branching, 1–4 dm. high, *pilose-hirsute with mixed pubescence*, leafy: *cauline leaves* 7–25, lanceolate, oblanceolate or oblong, entire or with low dentation, *with pubescence similar* to that of rosette and stem; *raceme* at first crowded, *finally much elongated and occupying* $\frac{1}{2}$–$\frac{4}{5}$ *the total height of the plant*, chiefly 10–60-flowered, *the lower* 4–12 *flowers* of the primary raceme usually *leafy-bracted: pedicels erect, the lowest becoming* 5–15 *mm. long* in fruit: sepals oblong or narrowly ovate, obtuse, pilose, 2–4 mm. long; *petals deep- to sulphur-yellow* when fresh, narrowly cuneate-obovate, rounded or but slightly emarginate at summit, 4–6 mm. long: anthers about 0.5 mm. long: ovary densely pubescent, with 30–50 ovules; *style elongate* (up to 1 mm. long): *siliques* lanceolate to linear-oblong, 0.7–2 *cm. long*, 1.5–3 mm. broad, *usually twisted, with style* 0.5–1.8 *mm. long; valves with dense mixed pilosity:* seeds 30–50, about 1 mm. long.—Vahl in Hornem. Fors. Dansk Oecon. Plantel. ed. 2: 599 (name), in Hornem. Fl. Dan. ix. fasc. xxv. 3, t. mccccIx (1818) and in Hornem. Fors. Dansk Oecon. Plantel. ed. 3,



Map 8. Range in eastern America of DRABA AUREA.

i. 696 (1821); DC. Syst. ii. 350 (1821) and Prodr. i. 170 (1824); Hook. Fl. Bor.-Am. ii. 55 (1830); Torr. & Gr. Fl. N. Am. i. 107 (1838); Watson in Gray, Syn. Fl. i[1]. 110 (1895) in large part; O. E. Schulz in Engler, Pflanzenr. iv[105]. 175 (1927) as to main form. *D. aureiformis* Rydb. Bull. Torr. Bot. Cl. xxviii. 278 (May, 1901). *D. Bakeri* Greene, Pl. Baker. iii. 6 (Nov. 18, 1901). *D. uber* Nelson, Bot. Gaz. xxxiv. 366 (1902). *D. aurea*, var. *aureiformis* (Rydb.) O. E. Schulz, l. c. 176 (1927). *D. aurea*, var. *aureiformis*, forma *uber* (Nelson) O. E. Schulz, l. c. 176 (1927).—Greenland, Labrador and Ungava; Alberta and British Columbia, south to South Dakota and Utah. Labrador: Ramah, *A. Stecker*, no. 216; Hebron, *Erdmann*, no. 63 (Brit. Mus.); Okkak, *Moravian Bros.*; Port Manvers, *E. B. Delabarre*, no. 93. Ungava: south of Fort George, James Bay, *A. P. Low*, Herb. Geol. Surv. Can. nos. 63,145, 63,146. Plate 296; map 8.

The report of *Draba aurea* from Michigan (Walpole, Papers Mich. Acad. Sci. vi. 313. 1926) was based on a fruiting specimen of *D. arabisans*.

Although it is customary in the Rocky Mountain region to consider *Draba aureiformis* Rydb. a species apart from *D. aurea* of Greenland and Labrador it would seem that those who do so have seen inadequate material of true Greenland *D. aurea* for comparison. Rydberg, in publishing it said

> This species is nearest related to *D. aurea*, but characterized by the small light yellow petals [in the description "sulphur yellow, 3–4 mm. long"], the slender style ["about 1 mm. long"], the less dense pubescence, and slender stem.

Schulz, in separating it, as var. *aureiformis*, gives the same general characters, which, had he seen fuller material from the Rocky Mountains, he would have found unreliable:

> Var. aureiformis: Planta saepe gracilior. Flores minores. Sepala 2–2,5 mm longa [in typical *D. aurea* "3 mm longa"]. Petala dilutiora, sulphurea, 3–4 mm longa [in *D. aurea* "aurea, 5 mm longa"]. Siliculae . . . 7–15 mm longae, 2,5–3 mm latae, stylo breviore 0,5–1 mm longo coronatae [in *D. aurea* "1,2–1,6 cm longae, 2–3 mm latae, . . . apice stylo tenui 1–1,5 mm longo coronatae"].

As for the more "slender" cordilleran plant, it may be pointed out that most of the Greenland plants in the Gray Herbarium have the flowering stems (1–4 dm. high) only 1–1.5 mm. in diameter at base, although the stoutest of the 61 stems of the Greenland plant before me has a maximum diameter of 3.5 mm. *Macoun's* no. 10,276 from Waterton Lake, Alberta (fig. 3), has the stems 2–2.5 mm. thick; these measurements are repeated by the cotype of *D. uber* Nelson (a low and compact form), by *Wolf & Rothrock's* no. 634 from Colorado,

by *Patterson's* no. 7 from Colorado, by *Goodding's* no. 1404 from Utah and by several other American specimens. Conversely, I fail to find a single cordilleran specimen "more slender" than the run of slender Greenland plants (FIGS. 1 and 2).

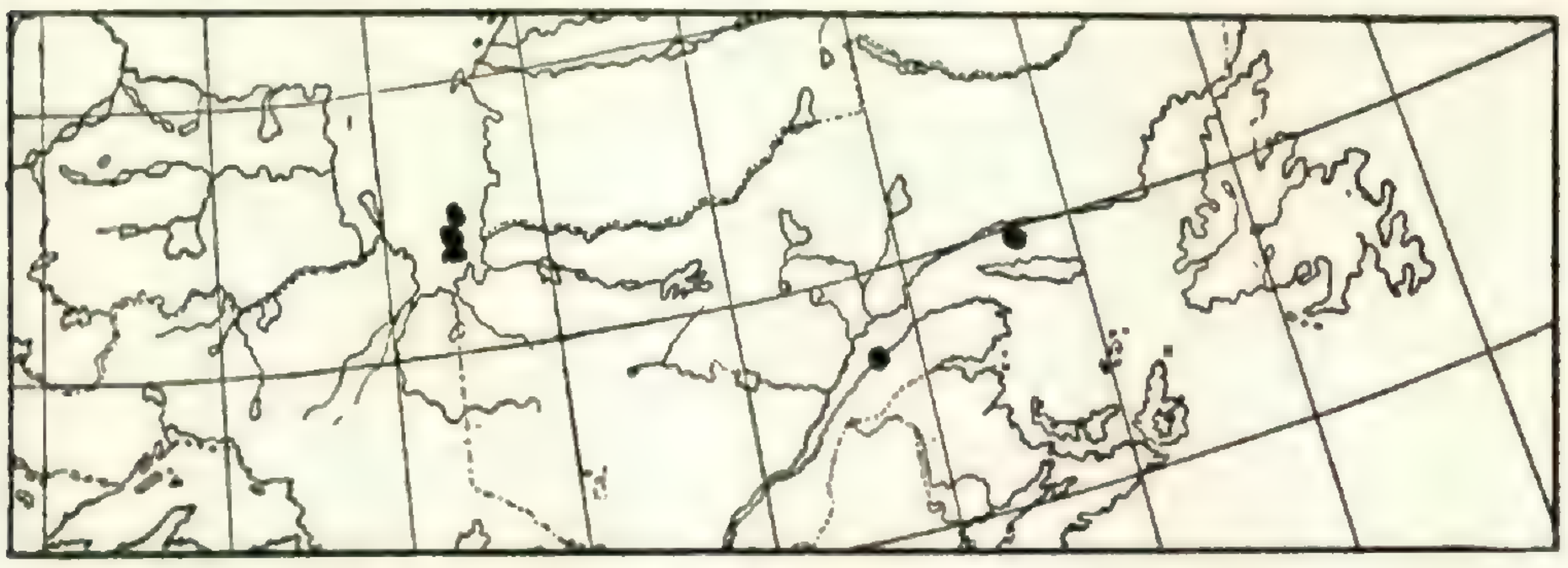
As for the smaller sepals (3 mm. long in the Greenland plant, 2–2.5 in the American), these measurements must have been optimistically made. 3 mm. is a good average for the Greenland specimens, but it is easy to find Greenland sepals 2.5 mm. long and not difficult to find them up to 3.5 mm. Although many American specimens have sepals only 2.5 mm. long, others show them longer: *Rydberg's* no. 516 from South Dakota, *Burke's* Rocky Mountain specimens, *Wolf & Rothrock's* no. 634 from Colorado and *J. R. Churchill's* collection of June 13, 1918 from Colorado all have them 3 mm. long; and such a beautifully prepared plant as *Patterson's* no. 7 from Gray's Peak shows many 3.2–3.3 mm. long, while *Payson & Payson's* young material, no. 5024, has them up to 3.4 mm. long. Similarly with the petals, it is not difficult to find plenty of petals of the cordilleran plant 4.5 mm. long (*Payson & Payson*, no. 5024, *Wolf & Rothrock*, no. 634, *Butters & Holway*, no. 40, etc., etc.), while a length of fully 5 mm. is easily measured in the Churchill and the Patterson specimens.

Although Schulz indicates that the siliques of the cordilleran plant are shorter (7–15 mm. long) than in the Greenland plant and that the styles are shorter, 0.5–1 mm. long, against 1–1.5 mm. in the Greenland plant, it is not without significance that the *Patterson* material so much cited and the *Macoun* plant from Waterton Lake (FIG. 3) should have siliques longer (17 mm. long) than Shulz allows for the Greenland plant; it is also important to note that the style in Greenland specimens (Upernavik, July 14, 1929, *Porsild*, our FIG. 2) may be well under 1 mm. in length, while in some cordilleran specimens (*Patterson*, no. 7, and *Butters & Holway*, no. 40) they are well over 1 mm. long.

With a residue of "sulphur yellow" against "aurea" as the specific or varietal difference between *D. aureiformis* and *D. aurea* it hardly seems worth while to attempt to keep them apart. As a Greenland and Labrador plant with a large cordilleran representation, *D. aurea* is consistent and is one of a large group of species with similar disruption of range. In the cordilleran region the group has greatly segregated and we get the fairly distinguished *D. luteola* Greene

(PLATE 297, FIGS. 6 and 7), *D. surculifera* Nelson (treated by Schulz as a form of *D. aurea*), *D. spectabilis* Greene, *D. neomexicana* Greene, *D. Helleriana* Greene and *D. pinetorum* Greene. On the limestone shores of the Gulf of St. Lawrence in eastern Quebec and on the calcareous islands of James Bay the group of *D. aurea* is represented by the following localized species.

9. D. **minganensis** (Victorin), comb. nov. *Biennial or perennial*, with simple to multicipital caudex: new *rosettes* 1–17 cm. across; *their leaves oblanceolate*, entire or sparingly dentate, 0.5–9 cm. long, 1.5–17 mm. broad, green to canescent, *the surfaces* more or less densely covered *with stalked and few-rayed irregularly stellate trichomes: flowering stems* 1–very many, simple to abundantly branched, 0.4–4 dm. high, *pilose-hirsute with simple, forking and stellate trichomes*, leafy: *cauline leaves* 7–25, oblong to narrowly ovate, *rounded to the sessile base*, entire or dentate, 0.5–4.2 cm. long, 0.2–2 cm. broad, *densely to sparsely stellate-tomentulose: racemes* corymbiform in anthesis, soon loosening and becoming in fruit 3–9 cm. long, 1.5–3.5 cm. in diameter, *standing well above the foliage* (very rarely with 1 basal



Map 9. Range of DRABA MINGANENSIS.

bract), mostly 10–30-flowered: *pedicels spreading to arched-ascending*, with pubescence as on the stem, *the lowest becoming* 2–4 *mm. long: sepals* 2.3–3.3 mm. long, oblong to oval, the herbaceous back *villous*, the broad margins hyaline: *petals yellow*, when fresh, 3.5–5.5 mm. long, narrowly cuneate-obovate, shallowly emarginate: anthers 0.3–0.4 mm. long: *ovary strongly villous-hirsute*, with 30–40 ovules and definite style: *siliques lanceolate to linear-oblong, usually twisted*, 1–1.8 *cm. long*, 2–4 mm. broad, *densely hirtellous with long divergent to retrorse unequally* 2–3-*pronged or* sometimes *simple trichomes mostly* 0.5–1 *mm. long; style* 1–1.5 *mm. long:* seeds brown, with conspicuous black hilum, 1 mm. long.—*D. luteola* Greene, var. *minganensis* Victorin, Trans. Roy. Soc. Can. sér. iii. xxii. (Sec. v.) 174, t. iv. (1928). Local, QUEBEC: Mingan Islands, July, 1882, *Linden;* sur le cailloutis nu et les lichens, sur la Pointe entre la Petite Île et "La Montagnaise," Archipel de Mingan, 29 juillet 1926, *Victorin & Rolland*, no. 24,828

(cotype in Gray Herb.); among boulders by the St. Lawrence, north base of Cap Enragé, Bic, July 8, 1905, *Williams, Collins & Fernald* (erroneously reported as *D. borealis* DC., in RHODORA, vii. 267 (1905); cold limy cliffs, north side of Cap Enragé, Bic, *Fernald & Collins*, no. 577 (erroneously reported as *D. aurea* Vahl, in RHODORA, ix. 161 (1907)); crevices of limestone-conglomerate, north side of Cap Enragé, Bic, *Fernald & Collins*, nos. 1064, 1065; sur le conglomérat nu, au nord du Cap Enragé, Bic, *Rousseau*, no. 26,582 (reported as *D. luteola* Greene, by Victorin, l. c.); talus, north slope, and beach under Cap Orignal. Bic, *Fernald & Collins*, nos. 578, 579; sur les schistes emittés, Pointe sud-ouest du Cap à l'Orignal, Bic, *Rousseau*, no. 31,007; sandy shore, Brushy Island, James Bay, *David Potter*, no. 546; sand along freshwater creek, 2–5 miles north of The Post, Charlton Island, James Bay, *Potter*, no. 247; sand and gravel, Little Charlton Island, *J. M. Macoun*, no. 1920 (see discussion on p. 250). PLATE 297, FIGS. 1–5 and PLATE 298; MAP 9.

Draba minganensis belongs to the yellow-flowered and leafy group of biennials and short-lived perennials which includes *D. aurea* M. Vahl and *D. luteola* Greene, with both of which it has been identified. From *D. aurea*, as clearly pointed out by Victorin, it differs in the strictly terminal racemes and the short pedicels. *D. aurea* (PLATE 296), furthermore, has the mature (fruiting) raceme very elongate, occupying ½–⅘ the entire height of the plant and, on account of the suberect pedicels, only 0.8–2.5 cm. in diameter. *D. minganensis*, with its shorter and thicker, strictly terminal racemes, with shorter and more spreading pedicels, is well separated from it, although its pubescence, especially of the siliques, is essentially the same.

Victorin left the plant of Bic (PLATES 298 and 297, FIG. 5) with the Rocky Mountain *Draba luteola* (PLATE 297, FIGS. 6 and 7) but separated from them the Mingan Island material (PLATE 297, FIGS. 1–4) as *D. luteola*, var. *minganensis:*

A typo differt: parvo habitu (4–9 mm. [cm.] long., raro 16 mm. [cm.]); caulinaribus foliis anguste ovo-lanceolatis (8–12 mm. long., 2 mm. lat.; raro 20 mm. long. et 5 mm. lat.), pubescentibus, ut caule stellaeformibus pilis densissimis longissimisque, praesertim inferius cum magnis dentibus spretis; foliis rosularibus generaliter integris.

I an unable, however, to separate on very fundamental lines the Mingan and Bic material. Most of the former (the type no.) is very small individuals (PLATE 297, FIGS. 1–3) from bare rocks and lichen-crust (one of the most sterile of habitats), conforming to Victorin's description in its low stature (4–9 cm.) and small leaves (8–12 mm. long, 2 mm. wide), but the Linden plant from the Mingans

(exact locality unknown) is better-grown and presumably from a more favorable habitat, 1.6 dm. high (very immature), with numerous branches. When fully grown it would have had considerable stature. At Bic *Draba minganensis* occurs either in the most sterile of dry gravels or in the most fertile of guano-enriched or cool and fog-moistened limy slopes and cliffs. In the driest gravel (*Fernald & Collins*, no. 578) the fully ripe fruiting plant (PLATE 297, FIG. 5) may be only 9 cm. high, with densely pubescent leaves only 5–10 mm. long. On rich and moist spots, however, it (PLATE 298) may be 4 dm. high, in the most luxuriant plants with as many as 20 freely branched flowering stems, with rosette-leaves up to 9 cm. long and 1.7 cm. broad and cauline leaves up to 4.2 cm. long and 2 cm. broad. These luxuriant plants, growing in cool and moist, highly enriched (with guano) habitats at Bic, certainly exceed in all points the starved type-material of *D. minganensis* and as a further response to their most favorable habitat their fleshy and brittle leaves have the pubescence more scattered than in the xerophytic type. The dwarf individuals (PLATE 297, FIG. 5) at Bic, however, growing in semi-arid conditions, have a stature as low, the leaves as small and the pubescence as dense as the type-collection (PLATE 297, FIGS. 1–3) from the Mingans. In many of the Bic specimens, furthermore, the cauline leaves show as appreciable toothing as in the Mingan plant, while some individuals of the latter series have nearly all the leaves entire. In the characteristic pubescence of the siliques, PLATE 298, FIGS. 2 and 3 (young in the Mingan material), and of the stems and pedicels I can find no difference. These characters seem to me more fundamental than the stature and the degree of toothing of the leaves.

Although the plant of Bic and the Mingan Islands has been placed with *D. luteola* Greene, of the Rocky Mountains, it differs from the cordilleran species in so many important characters that I cannot feel that the two are conspecific. *D. luteola*, as shown by a sheet of the type-collection and by others from the same region of Colorado (PLATE 297, FIGS. 6 and 7), has the pubescence of the entire plant very much finer than in *D. minganensis*, the stems and pedicels, as Greene correctly described them, "cinereously stellate-pubescent throughout, with only a scanty and dimly perceptible villous pubescence of simple hairs mixed with the stellate"; in *D. minganensis* the stems and pedicels are as pilose-hirsute as in *D. incana*. In *D. luteola*, as originally described, the racemes are "narrow and rather strict,"

the specimens showing them only 1.2–2 cm. in diameter (in *D. minganensis* 1.5–3.5 cm. thick); in *D. luteola* the slender and short-tomentulose lower pedicels are 4–8 mm. long (in *D. minganensis* thick, long-pubescent and only 2–4 mm. long). In *D. luteola* the siliques are pubescent with ascending to barely spreading and chiefly simple trichomes mostly less than 0.5 mm. long (in *D. minganensis* villous with divergent to retrorse mostly 2–3-pronged trichomes 0.5–1 mm. long). A habital character, furthermore, is apparently a singificant one. The primary racemes of *D. luteola* when mature make up, as in *D. aurea*, a large portion of the plant, occupying ⅓–⅔ its full height; in *D. minganensis* the thick spike is, in maturity, only ⅕–⅖ the full height of the stem.

The material from James Bay is both in anthesis and in fruit. It is all rather slender and with narrow leaves, but it has the pubescence of stems, leaves, pedicels and siliques which characterize *D. minganensis*. In the James Bay area alone does *D. minganensis* occur near *D. aurea*, which on the mainland near-by seems perfectly typical. For consideration of Mrs. Ekman's interpretation of *D. minganensis* as a hybrid see p. 250.

(*To be continued*)

DISTRIBUTION NOTES CONCERNING CERTAIN PLANTS OF GLACIER NATIONAL PARK, MONTANA

Bassett Maguire

From July 15th to August 15, 1932, the writer had opportunity to make observations on and collection of plants in Glacier National Park, Montana. These notes constitute record of certain plants which seem to establish new records for or extend our knowledge of distribution of several rare or unusual plants within this area.

Equisetum palustre L.: Occurring quite commonly along the shaded banks of the outlet of Lower St. Mary Lake. Reported by Standley from Belton, on the west side of the Park.[1]

Equisetum sylvaticum L.: Found in damp woodland at the head of Two Medicine Lake.

Larix Lyallii Parl.: A fine grove of this alpine larch occurs at timber line in Preston Park under the west slope of Siyeh Pass.

*Sparganium minimum Fries.: Locally abundant about a shallow pond 1 mile south of John's Lake (near Lake McDonald).

[1] Standley, P. C. Flora of Glacier National Park, Montana. Contr. U. S. Nat. Herb. Vol. 22, Part 5, 1921.

*The asterisk designates those plants which seem hitherto to have been unreported from the Park.

*POTAMOGETON FILIFORMIS Pers.[1]: Common in the bays about the inlet of St. Mary Lake, and near outlet of Lower St. Mary Lake.

*POTAMOGETON FILIFORMIS Pers., var. BOREALIS (Raf.) St. John.: This pond weed is common and generally distributed in shallow lakes and pond bottoms, and slow stream beds, particularly in the Swift Current and St. Mary drainage.

*POTAMOGETON VAGINATUS Turcz.: Locally abundant in Lower St. Mary Lake and Lower Two Medicine Lake. These two lakes support the finest development of pond-weeds to be found in this area.

*POTAMOGETON FRIESII Rupr.: Common about outlet to Lower St. Mary Lake, and in pools above Lower Two Medicine Lake.

*POTAMOGETON PANORMITANUS Biv., var. MINOR Biv.: Very abundant in shallow pond near outlet to Lower St. Mary Lake, and in bays at outlet of this lake. Rare in Two Medicine Lake.

*POTAMOGETON OBTUSIFOLIUS Mert. & Koch.: Collected and reported common by Dr. A. S. Hazzard and Mr. Marion Madsen in Howe Lake.

POTAMOGETON PUSILLUS L., var. MUCRONATUS (Fieber) Graebner.: Common about inlet of St. Mary Lake and stream bed between Lake Josephine and Swift Current Lake.

POTAMOGETON PUSILLUS L. *var. POLYPHYLLUS Morong. Lake Josephine.

POTAMOGETON EPIHYDRUS Raf., var. NUTTALLII (Cham. & Schlecht.) Fern.: Abundant in shallow ponds one mile south of John Lake. (According to Fernald[2] *P. epihydrus* is reported by Standley from Glacier Park as *P. compressus* L. The writer did, however, find a floating fragment of *P. zosteriformis* Fern., the *P. compressus* of Am. Auth., in Lower St. Mary Lake. This species should be sought there.)

POTAMOGETON TENUIFOLIUS Raf. (*P. alpinus* of Am. Auth.): Abundant in Lower Two Medicine Lake, and common in lakes and streams of the Swift Current drainage. (This is possibly the *P. lucens* L. reported by Standley.)

POTAMOGETON GRAMINEUS L., var. GRAMINIFOLIUS Fries.: Occurs abundantly in Lower Two Medicine Lake and commonly in Lake McDonald. (The *P. heterophyllus* Schreb. of Standley's Flora of Glacier Park.)

*POTAMOGETON PRAELONGUS Wulf.: Sterile material was found abundantly in Lower Two Medicine Lake and in deep water of St. Mary and Lower St. Mary Lakes.

STIPA COLUMBIANA Macoun.: Found growing as a weed in the Public Camp at Many Glaciers.

*POA PAUCISPICULA Scribn. & Merr.:[5] This arctic blue grass was found occurring occasionally in more protected pockets of deeper,

[1]The determinations of all Potamogetons and Carices reported in this paper were kindly verified or made by the Gray Herbarium.

[2] Fernald, M. L. The Linear-leaved North American Species of Potamogeton, Section Axillares. Mem. Gray Herb. III, July 1932.

more moist soil on the rocky slopes of Piegan Pass, well above the timber line, at an altitude of 7300 feet.

*Poa stenantha Trin.:[1] This interesting grass was collected along the dry, grassy, sparsely wooded north slopes near the outlet of St. Mary Lake.

*Glyceria grandis S. Wats.: Growing in marshy areas near outlet of Lower St. Mary Lake.

*Bromus ciliatus L.: In meadows near outlet of Lower St. Mary Lake.

*Carex aquatilis Wahlenb.: Growing in marsh below Two Medicine along with the abundant *C. Kelloggii* W. Boott.

*Carex pseudo-scirpoidea Rydb.: Occurring in marshes about inlet to Grinnel Lake.

*Carex Oederi Retz., var. pumila (Cosson & Germain) Fernald.: Growing in bog at John's Lake.

Carex vesicaria L., *var. distenta Fries.: In marsh about Swift Current (McDermott) Lake.

*Juncus nodosus L.: About low lying marsh near outlet to Lower St. Mary Lake.

Tofieldia palustris Huds.: Abundant in sphagnum bog at Preston Park.

*Salix monochroma C. R. Ball[6]?: This small willow occurs commonly at timber line about Gunsight Lake.

Salix commutata Bebb, *var. denudata Bebb:[2] Occurring commonly with the species about the shores of Gunsight Lake.

*Stellaria longifolia Muhl.:[3] Occurring in marsh near outlet to Lower St. Mary Lake.

*Draba McCallae Rydb.:[4] This plant was collected along shaded banks on the trail above Gunsight Lake.

Potentilla palustris (L.) Scop.: Occurring plentifully in the marshes of Mirror Pond, above St. Mary Lake.

Callitriche palustris L.: Growing abundantly on mud about pond near outlet to Lower St. Mary Lake, and in marsh south of John's Lake, occurring perhaps less commonly than *C. autumnalis* L. which is found generally in the quiet waters of the Park.

Hippuris vulgaris L.: The submerged form was found quite widely distributed in the Park; in St. Mary Lake, Lower St. Mary Lake, Swift Current Lake (McDermott Lake), Lower Two Medicine Lake, and elsewhere.

Myriophyllum exalbescens Fernald (*M. spicatum* L. of Standley's Flora of Glacier Park.): This aquatic also occurs generally in the waters of the Park, sometimes to a depth of 8 meters: John's Lake, Lake McDonald, Lower Two Medicine Lake, St. Mary Lake, Lower

[1] Identified by Dr. A. S. Hitchcock.
[2] Determined by Dr. C. R. Ball.
[3] Verified by Dr. K. M. Wiegand.
[4] Dr. K. M. Wiegand kindly compared this collection with a duplicate type deposited at the Cornell Herbarium.

St. Mary Lake, Flat Top Lake, Swift Current Ridge Lake (Bath Tub), and a small pond near Many Glaciers Hotel.

ECHINOPANAX HORRIDUM (J. E. Smith) Decaisne & Planch.: This handsome shrub was observed commonly along the woodland trail to Gunsight Lake (not collected).

CORNUS CANADENSIS L.: Growing in the woodland about Mirror Pond, above St. Mary Lake.

*STEIRONEMA CILIATUM (L.) Raf.: Found abundantly in swampy woodland about outlet, Lower St. Mary Lake.

*SCUTELLARIA EPILOBIIFOLIA Hamilt. (*S. galericulata* of Am. Auth.): Locally common in marshes south of John's Lake.

LIMOSELLA AQUATICA L.: This delicate little mud plant was found abundantly along the banks of Swift Current Creek, near its passage into Lake Sherburne.

VIBURNUM PAUCIFLORUM Pylaie.: Occurring in thickets on the sand beaches, inlet of St. Mary Lake.

*SOLIDAGO DILATATA A. Nels.:[10] Occurring on banks in the vicinity of Many Glaciers Checking Station.

*SOLIDAGO SCOPULORUM (Gray) A. Nels.:[1] The alpine form was collected in the meadows above Cracker Lake, and on rocky slopes at Piegan Pass.

ARNICA DIVERSIFOLIA Greene: Is splendidly developed in the woods, margin about Lake Josephine. Here and particularly in meadows about Elrod Lake is an exceedingly interesting form of the *Diversifolia* group which is not placeable in the above species.

The Section *Alpinae* of the Genus *Arnica* seems to be particularly well developed in the higher regions of the Park, yielding many varied forms which should be given more intensive field studies. There occurs here abundantly *A. alpina* of Am. Auth. (which is possibly not *A. alpina* (L.) Olin on the authority of Dr. Aven Nelson). About timber line occurs a plant referable to *A. Rydbergii* Greene, and in the rocky slopes at Piegan Pass (7500 ft.) was found a beautiful little member of this group which seemingly is not referable to any of the known species from North West America.

Mention here may possibly be made of a fine, large-leaved *Arnica*, probably of the *Foliosae* group, found in the low-lying swampy woodland at the outlet end of Lower St. Mary.

Unless otherwise noted, all specimens recorded in this paper are on deposit in the Herbarium of the Utah State Agriculture College.

UTAH STATE AGRICULTURE COLLEGE,
Logan.

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[1] Determined by Dr. Aven Nelson.

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JOURNAL OF

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Vol. 36. September, 1934. No. 429.

BOTANICAL NOTES

Ivar Tidestrom

Aconitum lutescens A. Nels., Bot. Gaz. **42**: 51. 1906. When the Flora of Utah and Nevada was in preparation, this species presented some difficulties. First of all, there was scarcely any material in our herbaria to support the validity of the species; secondly, the material at hand resembled too much that of *Aconitum columbianum* Nutt. Yet the writer included it in the flora as a full fledged species, hoping later to be able to clear the status of the "species." During the last three years the active field workers of the Forest Service have forwarded to Washington for determination a number of specimens which would naturally be referred to *Aconitum lutescens* except for other characters interfering. Our two most common species in the Rocky Mountain region are: *A. columbianum* and *A. bakeri*. These two species differ principally as follows:

Front line of hood nearly straight, the beak more or less prominent ..... *A. columbianum.*
Front line of hood curved, the beak nearly horizontal ..... *A. bakeri.*

The material forwarded by the Forest Service falls into these categories. That is, the material of *A. lutescens* with a straight beak agrees in all particulars with *A. columbianum* except as to the color of the flowers. A like condition exists in respect to *A. bakeri*. The writer is therefore inclined to place the material with ochroleucrous flowers in these two groups respectively. Let us see how the species in the sister genera, *Delphinium* and *Aquilegia* behave with respect to variations in the color of their flowers.

The writer has been acquainted with Aquilegia vulgaris L. since early boyhood. In 1894, he observed this species in the pastures of his home region. Within seeing distance he observed specimens with blue, pink or white flowers. This variation in color in species of *Aquilegia* had been observed by botanical writers long before the time of Linnaeus. Both Carl Hartman and Professor Lindman, not mentioning a host of others, maintain this view. Hartman does not evidently consider the variation in color of this species as any departure from the accepted concept of the species. On the other hand, he states: "*Var. med hårig stjelk*" which, translated into English, means "varying with hairy stalks." In the case of *Aquilegia caerulea albiflora* A. Gray, there are other characters besides that of color which entitle this form to varietal rank.

Delphinium barbeyi Huth is a second example of variation in color only. The writer, while riding over large forest areas in the Rocky Mountain region, has observed plants with pink or white flowers amid a "veritable sea of purple-blue-flowered individuals." As much as ten acres in extent may be seen adorning the high plateau of the Wasatch Mountains in central Utah, here and there and with scarcely a handful of pink or white-flowered specimens among these on any one area. Most of the species of *Delphinium* growing in France present variations in color similar to those existing in *Delphinium barbeyi* and other larkspurs of our own country. It is evident, therefore, that botanists generally do not consider color variation in the three sister-genera as of specific importance and, unless these variations are accompanied by other and real botanical characters, they are never considered as varietal determinants by field botanists.

Lathyrus polymorphus Nutt. Gen. Pl. **2**: 97. 1818. Nuttall described this species and gave as synonyms *Lathyrus decaphyllus* Pursh and *Vicia stipulacea* of the same author. He discarded the names of Pursh as being "inexpressive and deceptive." In their "Studies in certain North America Species of Lathyrus"[1] Butters and St. John discuss the somewhat involved case of *Lathyrus polymorphus*. They also refer Pursh's species *Vicia stipulacea* to the Nuttallian name, but they insist on taking up Pursh's descriptive adjective "stipulaceus" and bring the species under the name *Lathyrus stipulaceus* (Pursh) Butters & St. John.

[1] Rhodora **19**: 156. 1917.

In 1819, Dr. Torrey published his Catalogue of Plants,[1] wherein *Lathyrus stipulaceus* Leconte is described (p. 92). Dr. Torrey later reduced this species to a synonym of *L. myrtifolius* Muhl. (*L. palustris myrtifolius* (Muhl.) Gray).

In 1828, Dr. Torrey published "Some Accounts of a Collection of Plants made during a journey to and from the Rocky Mountains" . . . by Edwin P. James[2] wherein an account is given of two species of *Lathyrus* collected by Dr. James, U. S. A. Torrey calls one of them *Lathyrus polymorphus* Nutt., giving as synonyms *L. decaphyllus* and *Vicia stipulacea.* The other species described is given the name *Lathyrus myrtifolius* Muhl. In 1838,[3] Torrey and Gray published another Nuttallian species, *Lathyrus ornatus*, and gave as a synonym *L. polymorphus* Nutt. (including *L. decaphyllus* as a synonym). In this later publication Torrey and Gray have *Lathyrus polymorphus* Nutt. follow *L. ornatus*, while *Vicia stipulacea* Pursh appears again as a straight synonym under *L. polymorphus* Nutt. Torrey and Gray kept *L. ornatus* Nutt. and *L. polymorphus* Nutt. distinct, the former being published here for the first time. Butters and St. John, who combine the two species of Nuttall, give the following: Mr. Bayard Long, after comparing the type specimens of *Vicia stipulacea* Pursh and *Lathyrus ornatus* Nutt. in the herbarium of the Philadelphia Academy, reports to us, "I should say that they are unquestionably identical." Rydberg, in his new Flora of the Prairies and Plains of Central North America, has accepted the name *Lathyrus stipulaceus* (Pursh) Butters & St. John, citing *L. ornatus* Nutt. as a synonym, but does not mention *L. polymorphus* Nutt.

Under the Vienna Code the name *Lathyrus stipulaceus* (Pursh) Butters & St. John is valid for the plants in question. Under the American Code as well as under the International Code of 1930, a homonym of later date is inadmissable and *Vicia stipulacea* Pursh should properly be referred to *Lathyrus polymorphus* Nutt.

Range Extension of two Plant Immigrants. A great number of European plants are now adventive and established within the limits of the United States. Long before the establishment of a "pure seed policy," seeds of many of our European weeds came in with grain, in emballage and by other means, and have become fully established and listed in nearly all of our floras. Of these immigrants, Conium

[1] Catalogue of Plants of New York.
[2] Ann. Lyc. N. Y. 2: 180. 1828.
[3] Torrey & Gray, Fl. N. Amer. 1: 277. 1838.

MACULATUM L. and DIPLOTAXIS TENUIFOLIA (L.) DC. deserve some mention. Both species have been listed in the floras of the Eastern states for many years, and both have appeared on the Pacific Coast for some time. *Conium maculatum* was recorded from California by Brewer & Watson in Botany of California (**1**: 258. 1876) as "sparingly introduced in waste places in the neighborhood of the older towns." Jepson reports it as "widely distributed" (Manual of Flowering Plants of California 706. 1925). The writer collected the species at Carson City, Nevada, in 1919 (*Tidestrom* 10,215). Since that time the species has been discovered in Colorado. Mr. L. C. Shoemaker of Forest Service collected *Conium maculatum* on the Holy Cross National Forest, November 8, 1931, at an elevation of 2,400 meters.

DIPLOTAXIS TENUIFOLIA (L.) DC. is another species with a history of migration similar to that of *Conium maculatum*. Long established in eastern North America from Canada to Alabama, it has also been recorded from Pasadena and Santa Ana, California. On April 25, 1930, Forest Ranger A. M. Cusick collected the species (U. S. For. Serv. 65,457) on Lemhi National Forest, Custer County, Idaho, at an elevation of 1,500 meters. The illustration of the species given by Bonnier (Flore de France, Suisse et Belgique **1**: *pl. 32. f. 139*) applies well to the Idaho specimen. Generally *D. tenuifolia* is glabrous, but occasionally specimens with simple or branched hairs have been observed, as in the case of *D. muralis*. Our California specimens are glabrous. Some of the specimens from the Eastern States are sparingly hirsute as in the Idaho specimen. The variation in the species as to pubescence was noted by Bonnier, who describes the leaves as "*un peu glauque, sans poils ou presque sans poils.*"

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POTOMOGETON PANORMITANUS IN THE SUDBURY RIVER.—Collecting *Potamogeton* is a diversion from which the average amateur botanist at last may derive some intellectual satisfaction. Thanks to Professor Fernald's extraordinarily lucid monograph on the linear-leaved North American species,[1] there is now a good sporting chance of making

[1] Fernald: The Linear-leaved North American Species of Potamogeton, Section Axillares: Mem. Am. Acad. Arts & Sci. XVII, Part I, July 1932.

satisfactory determinations. Moreover, there is a certain element of suspense, well maintained from the moment the slimy strings are picked off the rake to the final curtain when the specimens are gleefully submitted to High Authority for verification. The chances of turning up something worth while are always excellent.

For example, the authors of this note spent a brief twilight hour on the Sudbury River at Wayland, Massachusetts, last summer (August 8, 1933) and in due course discovered themselves to be the proud collectors of authentic *P. panormitanus* Biv., var. *major* G. Fischer in young fruit. With the exception of Nantucket and Marthas Vineyard, this species apparently has not been reported as occurring in southern New England east of the Berkshires. According to Fernald it shows a very striking preference for basic or slightly alkaline (or brackish) waters. Consequently it seems somewhat out of place in a sluggish river noted for its peaty meadows. A specimen has been filed at the Herbarium of the New England Botanical Club.—Richard J. Eaton and Ludlow Griscom.

A Grass new to Missouri.—During the month of September, 1933, while in Forest Park in the city of St. Louis, the writer noticed a strange-looking grass growing about the margins of the northeast portion of the Lagoon at the base of "Art Hill." Superficially, the ovate-lanceolate leaves with strongly clasping bases, papillose-hispid nodes and sheaths, and ciliate margins towards the base of the blades suggested an abnormal-appearing *Panicum clandestinum*, but the long slender awns protruding from each of the spikelets and the habit of creeping at the nodes added puzzlement to the situation. The grass was determined at the U. S. National Herbarium, and found to be *Arthraxon hispidus* (Thunb.) Merr. var. *cryptatherus* (Hack.) Honda, a species of the tribe *Andropogoneae*, but, according to Mrs. Agnes Chase, "an exception of all the keys except Professor Hitchcock's, and his is not yet published." It is a native of China, Japan, and Korea, and is a recent introduction in the United States, having been collected in this country previously from half a dozen states. Although it has been collected from Arkansas, this is its first record from Missouri.—Julian A. Steyermark, Missouri Botanical Garden, St. Louis, Mo.

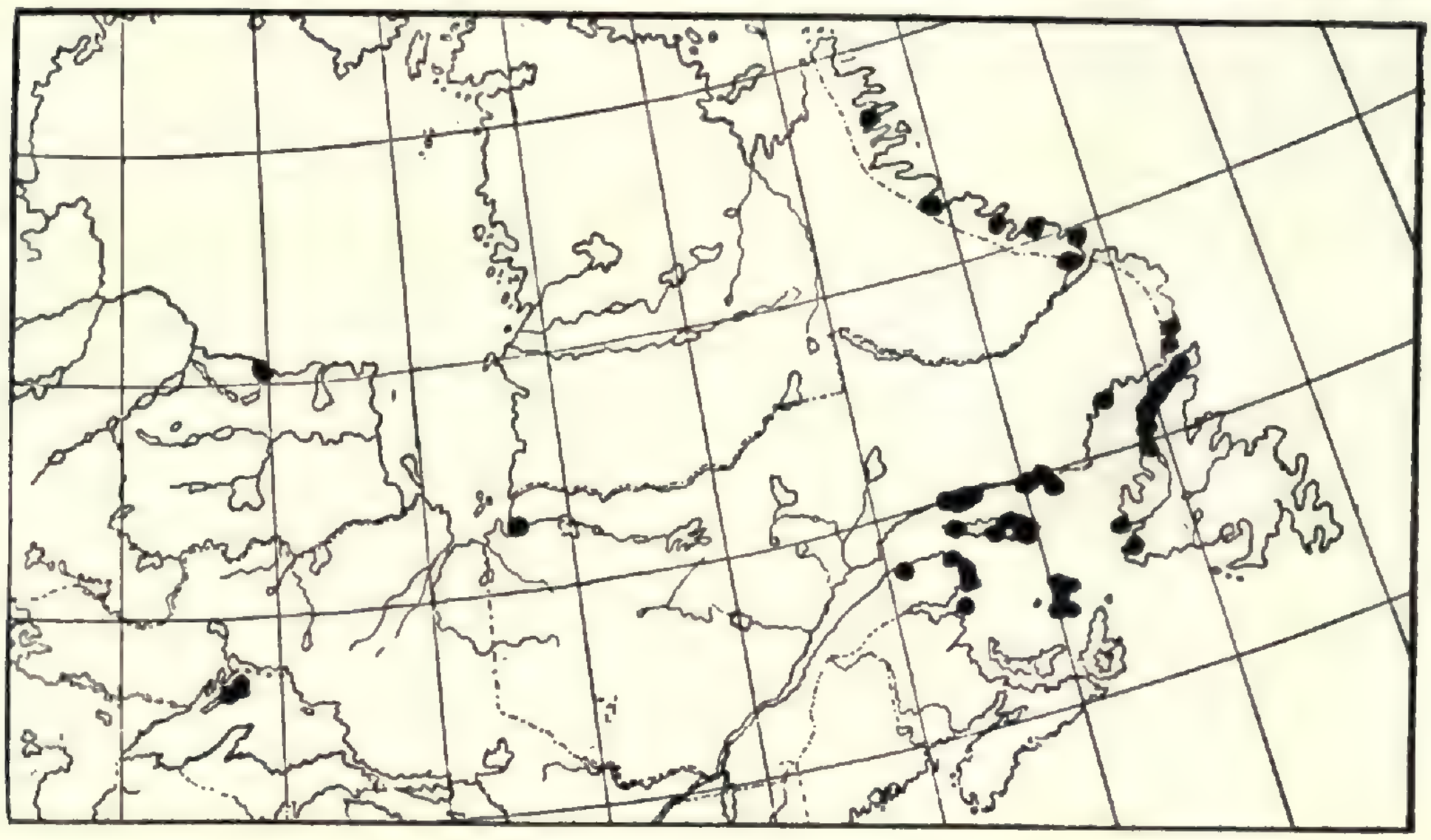
DRABA IN TEMPERATE NORTHEASTERN AMERICA

M. L. FERNALD

(*Continued from page 305*)

10. D. INCANA L. *Biennial* (rarely slightly perennial by the brief persistence of basal offshoots), with a simple or more or less multicipital ascending to decumbent caudex: *lower leaves* of the rosettes *shriveling soon after anthesis, the rosette-leaves not strongly contrasting with the lower cauline; the subspherical rosettes of the* 1*st year loosening and elongating to form the usually leafy* (up to 50, rarely to 95 leaves) *flowering stem: rosette-leaves* lanceolate or oblanceolate, 0.5–3 cm. long, 2–5 mm. broad, mostly *ciliate with long simple or bifurcate trichomes* and glabrous to hirtellous on the surfaces; *cauline leaves* few to very many, the lower narrow, the upper gradually broader and oblong to ovate, usually remotely dentate, *hirsute* with variously mixed simple, bifurcate and stellate trichomes: *flowering stem* 0.15–5 dm. high, simple to much branched, *usually densely leafy, pilose-hirsute to tomentulose or villous, especially above, and on the axis of the raceme with long* simple and variously forked *and implicated trichomes:* raceme at first dense, elongating in fruit, becoming 1–15 cm. long, few–100 (or more)-flowered; *the lower* 1–6 *flowers of the primary raceme usually leafy-bracted: pedicels densely pilose to villous,* the lowest becoming 1–5 mm. long: sepals oblong to elliptic, 1.5–2.5 mm. long, pilose on the back, white-margined: petals white, narrowly cuneate-obovate, emarginate or obtuse, 2.5–5 mm. long: anthers 0.3–0.5 mm. long: pistil glabrous, with 16–40 ovules and with a very short style: *siliques oblong or elliptical to lanceolate,* 4–14 mm. long, 1.5–3 mm. broad; *style obsolete or thick and up to* 0.3 *mm. long:* seeds 0.7–1 mm. long.—Sp. Pl. ii. 643 (1753); Torr. & Gray, Fl. N. Am. i. 107 (1838), in part; Hook. Fl. Bor.-Am. i. 54 (1830); Fern. & Knowlt. RHODORA, vii. 63, t. 60, figs. 1 and 2 (1905); Elis. Ekm. Kungl. Svenska Vet.-Akad. Handl. ser. 3, ii. no. 7: 36 (1926); O. E. Schulz in Engler, Pflanzenr. iv[105]. 282 (1927). *D. contorta* Ehrh. Beitr. vii. 155 (1792); DC. Syst. ii. 348 (1821) and Prodr. i. 170 (1824). *D. incana,* β. *contorta* (Ehrh.) Liljebl. Nov. Act. Reg. Soc. Sci. Ups. vi. 57 (1799).—Greenland; Labrador, Newfoundland and Saguenay and Gaspé Cos., Quebec; shores of James Bay; islands of Lake Superior, Michigan; boreal Eurasia. The following are characteristic. LABRADOR: Titterasuk, *C. S. Sewell,* no. 40; Nain, *Sewall,* no. 79; shore, Rigoulette, *Sornborger,* no. 70, *Bowdoin College Exped.* 1891, no. 269, *R. H. Wetmore,* no. 102,959; wet rocky hillsides, Indian Harbor, *Harlow Bishop,* no. 327. NEWFOUNDLAND: gravelly limestone shore, Cape Norman, *Wiegand, Griscom & Hotchkiss,* no. 28,348; calcareous rocks and talus, entrance to Port Saunders Harbor, *Fernald, Wiegand & Kittredge,* no. 3452; headlands of Cape St. George, *Mackenzie & Griscom,* no. 11,089[a]. QUEBEC: grassy gully, Île Kécarpoui, Archipel

de Kécarpoui, Saguenay Co., *St. John*, no. 90,477; Anticosti, June 23, 1861, *Hyatt, Shaler & Verrill;* sur le talus du rivage, Pointe de l'Est, Anticosti, *Victorin & Rolland*, no. 21,032; aux alentours au phare sur le cailloutis calcaire, Pointe de l'Est, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 21,479; sur les graviers calcaires, Baie du Renard, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 21,467; gravier du barachois, R. au Saumon, Anticosti, *Victorin et al.*, nos. 21,468, 21,473; sur les graviers du barachois, R. Dauphine, Anticosti, *Victorin & Rolland*, no. 27,310; graviers, Lac à la Croix, Anticosti, *Victorin & Rolland*, no. 27,311; bord de la lagune, Lac Salé, Anticosti, *Victorin & Rolland*, nos. 24,864, 27,192; Baie Ste.-Claire, Anticosti, *Victorin*, no.



Map 10. American Range of Draba incana.

4139; sur les cailloutis calcaire du sommet, Cap Gaspé, *Victorin, Rolland, Brunel & Rousseau*, no. 17,381; turfy crest of sea-cliffs, Cape Gaspé, *Pease*, no. 20,219; Anse-a-l'Indien, près du Cap Gaspé, *Victorin et al.*, no. 17,384; conglomerate (calcareous) sea-cliffs, Bonaventure Island, *Fernald & Collins*, no. 1082, *Victorin et al.*, no. 17,386; crests of calcareous sea-cliffs, Cap Blanc, Percé, August 17, 1904, *Collins, Fernald & Pease;* July 26, 1905, *Collins & Fernald*, no. 88; schistes, Chloridorme, *Rousseau*, nos. 31,214, 31,222; turfy roadside bank, Cap Chat, *Fernald & Pease*, no. 25,089. Magdalen Islands: dry crevices or talus of East Cape, Coffin Island, *Fernald, Long & St. John*, no. 7505, in part (mixed with var. *confusa*). Ontario: Fort Severn, Hudson Bay, August 8, 1887, *J. M. Macoun*. Michigan: Gull Islands, Lake Superior, *W. S. Cooper*, no. 112 (as *D. arabisans*, var. *orthocarpa*); rock crevices, Passage Island, near Isle Royale, *Povah, Brown & McFarlin*, no. 3671B (Univ. Mich.). Map 10 (including vars.).

Var. confusa (Ehrh.) Liljebl. *Siliques pubescent.*—Nov. Act. Soc.

Sci. Ups. vi. 57 (1799); Poir. Encycl. Suppl. ii. 524 (1811); Fern. & Knowlt. RHODORA, vii. 64 (1905): O. E. Schulz, l. c. 285 (1927). *D. confusa* Ehrh. Beitr. vii. 155 (1792); DC. Syst. ii. 348 (1821) and Prodr. i. 170 (1824), mostly. *D. incana* β. *hebecarpa* Lindbl. Linnaea, xiii. 331 (1839). *D. incana*, subsp. *confusa* (Ehrh.) Elis. Ekm. l. c. 36 (1926).—Greenland and Labrador to Newfoundland, Magdalen Islands, northeastern New Brunswick and James Bay, generally more common than the glabrous-fruited plant. LABRADOR: Okkak, *Moravian Bros.;* Nain, *C. S. Sewall*, no. 77, in part; Hopedale, *Sewall*, no. 169; edge of "The Park," Hopedale, *Abbe, Hogg & Forbes*, no. 370; on a roof, Fox Harbor, *J. A. Allen*, no. 76; West Point at mouth of Red Bay, September 6, 1923, *A. G. Huntsman*. NEWFOUNDLAND: turfy limestone barrens, Burnt Cape, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, no. 28,350; springy swales and turfy shores, Boat Harbor, *Fernald, Wiegand & Long*, no. 28,351; turfy slope near mouth of Big Brook, *Fernald & Long*, no. 28,349; turfy limestone barrens, Sandy (or Poverty) Cove, Straits of Belle Isle, *Fernald, Long & Gilbert*, no. 28,352; turfy limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,715; peaty pockets in limestone ledges, Brig Bay, *Fernald, Long & Dunbar*, nos. 26,706–26,708; turfy shore, Bard Harbor, *Wiegand, Gilbert & Hotchkiss*, no. 28,353; turfy limestone barrens, St. John Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,354; turf overlying limestone, Grassy Island, St. John Bay, *Fernald, Long & Fogg*, no. 1729; dry gravelly limestone barrens, Pointe Riche, *Fernald, Long & Fogg*, no. 1730; turfy limestone shore, Sandy Cove, Ingornachoix Bay, *Fernald, Long & Dunbar*, no. 26,709; calcareous rocks and talus, entrance to Port Saunders Harbor, *Fernald, Wiegand & Kittredge*, no. 3454; turfy crests of calcareous cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 3453; abundant on roof of shanty, mouth of Barachois Brook (near Robinson Head, Bay St. George), *R. B. Kennedy*, nos. 1–3. QUEBEC: grassy shore, Îles Boisées de Cap Blanc, Washtawouka, Goynish, *St. John*, no. 90,481; grassy places, Archipel de Kécarpoui, *St. John*, nos. 90,478–90,480; turfy ledges, Île Triple, Archipel Washicouti, *St. John*, no. 90,482; sur un îlôt de gneiss laurentien, Îlets de la Baie à Jean, *Victorin & Rolland*, no. 18,249; sur le gneiss laurentien, Îlôts à Charles, Natashquan, *Victorin & Rolland*, no. 18,250; vielle prairie au bord de la mer, Pointe-aux-Esquimaux, *Victorin & Rolland*, no. 18,247; sur le cailloutis calcaires au bord de la mer, Île à la Vache Marine, Mingan, *Victorin & Rolland*, no. 18,248; sur le gravier calcaire, Île Ste.-Généviève, Mingan, *Victorin & Rolland*, nos. 21,465, 21,475; shore of Salt Lake, Anticosti, *J. Macoun*, no. 19; limestone detritus, crest of Cap Barré, Percé, August 16, 1904, *Collins, Fernald & Pease*, July 23, 1905, *Collins & Fernald*, no. 89, August 1, 1907, *Fernald & Collins*, no. 1080; calcareous sea-cliffs, Bonaventure Island, *Fernald & Collins*, no. 1081; clay soil, river-bank, Rupert House, James Bay, *David Potter*, no. 548. MAG-

DALEN ISLANDS: dry sandy summit of Great Bird Rock, *St. John*, no. 1893; dry sandy headland, Brion Island, *St. John*, no. 1890; dry crevices or talus of East Cape, Coffin Island, *Fernald, Long & St. John*, no. 7505, in part; sur le sommet du Cap-de-l'Est, *Victorin & Rolland*, no. 9485; Entry Island, June 23, 1861, *Hyatt, Verrill & Shaler;* Pointe-aux-Vaches-Marines, Île de la Grand-Entrée, *Victorin & Rolland*, no. 9486; turfy crests of headlands and dry gravelly beach, Grindstone, *Fernald, Bartram, Long & St. John*, nos. 7503, 7504; sur les alluvions près de l'eglise, Île du Havre-aux-Maisons, *Victorin & Rolland*, no. 9584; Amherst, *Frits Johansen*, no. 93,671. NEW BRUNSWICK: grass plain, Grande Plaine, Miscou Island, *S. F. Blake*, no. 5590. PLATE 299.

Draba incana, in the regions where it abounds, is often weed-like, taking possession or recently exposed gravels, humus of rotting roofs, litter from the sea and the fisheries and other quite modern habitats. It is equally at home on the driest of gravels, ledges and sands and in the manure pile. *D. incana*, consequently, behaves in western Newfoundland and eastern Quebec just as it does in Greenland: "**Draba incana** L., the commonest species in the southern section [of western Greenland], is nitrophilous and often found on manured spots."[1] In such spots, of course, it is what O. E. Schulz calls "var." *luxurians* or "var." *robusta*. *D. incana*, therefore, as a quick-growing species, usually a biennial or winter-annual, varies extremely in size and habit. On the most xerophytic spots it may come to complete maturity with a stature of only 1.5–2 cm;[2] in rich humus, decaying litter or fertilized spots it may be 3–5 dm. high, either simple or freely branched, and with the almost innumerable leaves (the many leaves of the large 1st-year rosettes carried up by elongation of the axis) crowded or loosely imbricated. In single colonies individuals from a single sowing of seeds may be quite simple or may form loosely to densely cespitose mats with multicipital caudices, obviously dependent on food-supply and moisture; and single individuals of the latter habit may have either very densely leafy flowering stems (derived from vigorous primary rosettes) or almost leafless ones (derived from weaker secondary offshoots) springing from the identical base.

In some individuals in arid habitats the subspherical cabbage-like rosettes of the 1st year, deprived of moisture, scarcely lengthen to flower and fruit, producing low conical fruiting plants with closely crowded leaves and capitate racemes. Upon selected individuals

[1] Porsild, Meddel. om Grønl. xcii. No. 1: 30 (1932).
[2] Fernald, RHODORA, XXXV. 127, t. 239, fig. 5 (1933).

(FIG. 2) such as these (from Cap Barré, Percé) is based var. *conica* O. E. Schulz, l. c. 285 (1926); but other individuals (FIG. 5) from the same spot, especially those collected in a succeeding and wet, instead of dry, summer, with stems up to 3 dm. high, with leaves 1–2 cm. apart and with racemes elongate to 8 cm. or more (the tips still in anthesis), clearly demonstrate that var. *conica* is of absolutely no taxonomic value and would better have been suppressed.

Similarly, the other "varieties" and "subspecies," based merely on height, degree of branching, leafiness and other every-day responses to poverty or to richness of soil, seem too artificial for serious consideration; it would be as illogical to treat as varieties and subspecies the short or tall, simple or branched, small-leaved or large-leaved individuals of *Chenopodium album* or any other annual or biennial weed of neglected fields and disturbed soils. The minor edaphic responses of this nature proposed in *Draba incana* include the following (and several others, not accredited to North America), which make a most unnecessary and unwelcome load which must be carried along eternally in synonymy.

Var. *nana* Lindbl. Linnaea, xiii. 332 (1839); O. E. Schulz, l. c. 284 (1927). "Planta pusilla. Caules 1, 5–10 cm longi, simplices vel ramosi, paucifolii, rarissime aphylli." [FIG. 4 and 2 stems of FIG. 1].

Var. *stricta* Hartm. Handb. Skand. Fl. ed. 2: 178 (1832); O. E. Schulz, l. c. 285 (1927). "Caulis strictus, simplex vel apice tantum ramosus, foliis numerosis (usque ad 50 vel etiam ad 95 . . .) valde approximatis imbricatis apicem versus sensim minoribus (igitur planta in adspectu conica!) obsessus. Flores paulo minores." [FIG. 6].

Var. *conica* "O. E. Schulz (n. var.)—*D. incana* Fernald et Knowlton! in Rhodora VII. 76. (1905) 63, t. 60, Fig. 1 et 2, non L.—Habitu varietatis *strictae*, sed humilior, 2–14 cm. alta. Racemus fructifer ± capitato-confertus. Siliculae minutae, 5–8 mm longae [in typical *D. incana* "6–12 mm longae"], pedicellis 3–1 mm longis [in typical *D. incana* "4–2 mm longis"] insidentes." [Selected starved individuals (FIG. 2) from Cap Barré, above discussed. Other individuals (FIG. 5) from the same lot of seed are "var. *stricta*." All of them, however, having copiously stellate-pilose siliques, are the earlier-published var. *confusa* (Ehrh.) Liljebl. (1799).]

Var. *luxurians* Aug. Berlin, Öfvers. Kgl. Vet.-Akad. Förhandl. Stockh. (1884), no. 7: 25 (1884); O. E. Schulz, l. c. 285 (1927). "Planta elata, 35 cm alta, viridula. Caulis densifolius, superne ramosus. Racemus terminalis basi bracteatus [typical *incana* "0,10–0,35 m alta . . . plerumque foliis multis (usque ad 55!) dense foliosi, . . . Racemus . . . floribus imis (1–6) saepe in axillis foliorum supremorum"]. Siliculae infimae pedicellis elongatis usque ad 4 cm. longis flexuosis insidentes (quasi corymbi racemorum lateralium ad siliculam unicam reducti!)" [Aberrant individuals such as are likely to occur in almost any species!]

Var. *robusta* "O. E. Schulz (n. var.)— . . . *Draba incana* Smith and Sowerby, Engl. Bot. VI. (1797) t. 388, non L. Planta robusta, usque ad 50 cm alta, viridula. Folia caulina numerosa, obovato-cuneata, acuta, utrinque dentibus acutissimis inaequalibus utrinque 2–5 inciso-dentata, inferiora 3,5 cm longa [typical *D. incana* with "Folia basalia . . . 1–2,5 cm longa; folia caulina . . . oblongo-ovata, acutiuscula, utrinque dentibus manifestis 1–3-dentata"].

An besonders fetten Stellen und in Kultur."

The statement of habitat shows that Schulz's last variety is merely luxuriant plants of cultivation or of unusually rich soil. Smith, whose plant of the English Botany is cited, had sufficient understanding not to call his plant different, simply because it was in the garden: "The root is biennial, flowering early in the second summer. The specimen here represented was sent from Scotland young, . . . and being planted in a garden, flowered more luxuriantly than is usual on rocks or walls; but the plant often grows in rich moist spots even on its native mountains. The specimen in Flora Danica is a starved one."[1]

The publication or the maintaining of such individual responses as true varieties in this day and generation (more pardonable a century ago), when a systematist, in order to qualify as competent, should be required to show at least elementary understanding of the simplest and most common edaphic responses of plants, is not worthy taxonomy; it is merely a mechanically artificial imitation of it. When one witnesses such matter put out as ostensibly serious and scholarly publication on page after page of elaborate books, he cannot help regretting that the obligation to maintain in our greater botanical libraries complete series of taxonomic works has made it necessary to pay for this single 396-page part of a volume $11.75 (gold), precious money which ought to have been available for a higher type of science. Such cases, as we say in America, "hit the pocket-nerve"; and they make one seriously doubt the economic wisdom of the priority-principle in nomenclature, the principle which, unfortunately, has established a paying market for any so-called taxonomic publications which, regardless of how padded they may actually be, can display an occasional "n. sp.," "n. var." or "n. comb." in their pages. The "new deal," the world over, calls for scrupulous inspection and editing before publication.

11. D. **Sornborgeri,** sp. nov. (TAB. 300, FIGS. 1–3), planta perennans denique pluricaulis fructifera 1.5–2.5 dm. alta; caudiculorum

[1] Smith, Engl. Bot. vi. t. 388 (1797).

ramis lucidis albescentibus foliis emortuis persistentibus tectis; caulibus simplicibus vel imo ramosis glaberrimis lucidis; foliis caulinis rhomboideo-lanceolatis vel oblongo-oblanceolatis membranaceis glaberrimis 1–2.3 cm. longis integris vel sparse dentatis pilis simplicibus vel furcatis remote ciliatis; racemis floriferis corymbiformibus fructiferis elongatis (rhachi 2–12 cm. longo) 2–24-floris; pedicellis 4–10 mm. longis glabris erecto-patentibus; sepalis oblongis obtusis sparse pilosis 2.5–3 mm. longis 1.2–1.7 mm. latis; petalis lacteis obovatis emarginatis valde unguiculatis 3.5–4 mm. longis 2–2.5 mm. latis; antheris 0.3 mm. longis; ovariis glabris 28–40-ovulatis; siliculis glabris oblongis subacutis 6–10 mm. longis 2–2.5 mm. latis stylo brevissimo (0.1–0.2 mm. longo) coronatis, valvis reticulato-nervosis; seminibus a funiculis 0.3–0.5 mm. longis pendulis ovoideis 0.8 mm. longis.—LABRADOR: slope of moist slaty detritus immediately below a field of snow, at about 500 m. alt., Ramah, August 20–24, 1897, *J. D. Sornberger*, nos. 61 (TYPE in Gray Herb.), 175 in part; originally distributed as *D. stenoloba* Ledeb. MAP 11.

MAP 11. Range of DRABA SORNBORGERI.

Draba Sornbergeri, erroneously reported as *D. stenoloba* by Fernald & Sornberger, Ott. Nat. xiii. 100 (1899), is unique among our leafy perennial species in its almost wholly glabrous character. From *D. stenoloba* it differs at once in its leafy and usually more branching stems, *D. stenoloba* having them simple and naked or with 1–3 remote leaves; by its glabrous character, the leaves and at least the bases of the stems in *D. stenoloba* being obviously hispid with simple and forking hairs; by the shorter racemes (the longest barely half the height of the plant) with shorter ascending pedicels and shorter and broader siliques, the northwestern *D. stenoloba* having the mature racemes one-half to two-thirds the entire height of the plant, the divergent to reflexed fruiting pedicels 7–15 mm. long and the linear siliques 1.2–2 cm. long.

Schulz treats *Draba Sornborgeri* as *D. crassifolia*, var. *Parryi* (Rydb.) O. E. Schulz, the latter based nomenclaturally on *D. Parryi* Rydb. Bull. Torr. Bot. Cl. xxix. 241 (1902); but in describing the variety Schulz was more influenced by the plant of Labrador than by true *D. Parryi* (PLATE 300, FIGS. 4 and 5) of Colorado and Wyom-

ing. *D. Parryi* or *D. crassifolia*, var. *Parryi*, briefly considered in this paper under *D. crassifolia*, is an extreme of *D. crassifolia* with linear-oblanceolate, acute rosette-leaves and nakes scapes, the fully mature plants rarely up to 1.6 dm. high and with racemes up to 25-flowered. Rydberg's original description of it was clear:

> Annual, perfectly glabrous, except a few cilia on the petioles: stems several, usually less than 1 dm. high, scapiform or rarely with a stem leaf: basal leaves numerous, linear or narrowly linear-oblanceolate, 1.5–2.5 cm. long; pedicels spreading, in fruit 5–8 mm. long: flowers small; petals scarcely 2 mm. long, white or light yellow: pods erect, oblong, 5–8 mm. long, 1.5–2 mm. wide, glabrous: style obsolete.

Flowering and fruiting plants from the type-locality (Gray's Peak, Colorado) of *Draba crassifolia*, var. *Parryi* (*Patterson*, no. 6) are shown in PLATE 300, FIGS. 4 and 5. How different are they from the characterization of Schulz of var. *Parryi:*

> Planta altior et ramosior, fructifera usqe ad 20 cm longa. Caules interdum 3–4-phylli. Etc.

a characterization based not on *D. Parryi* but on *D. Sornborgeri!*

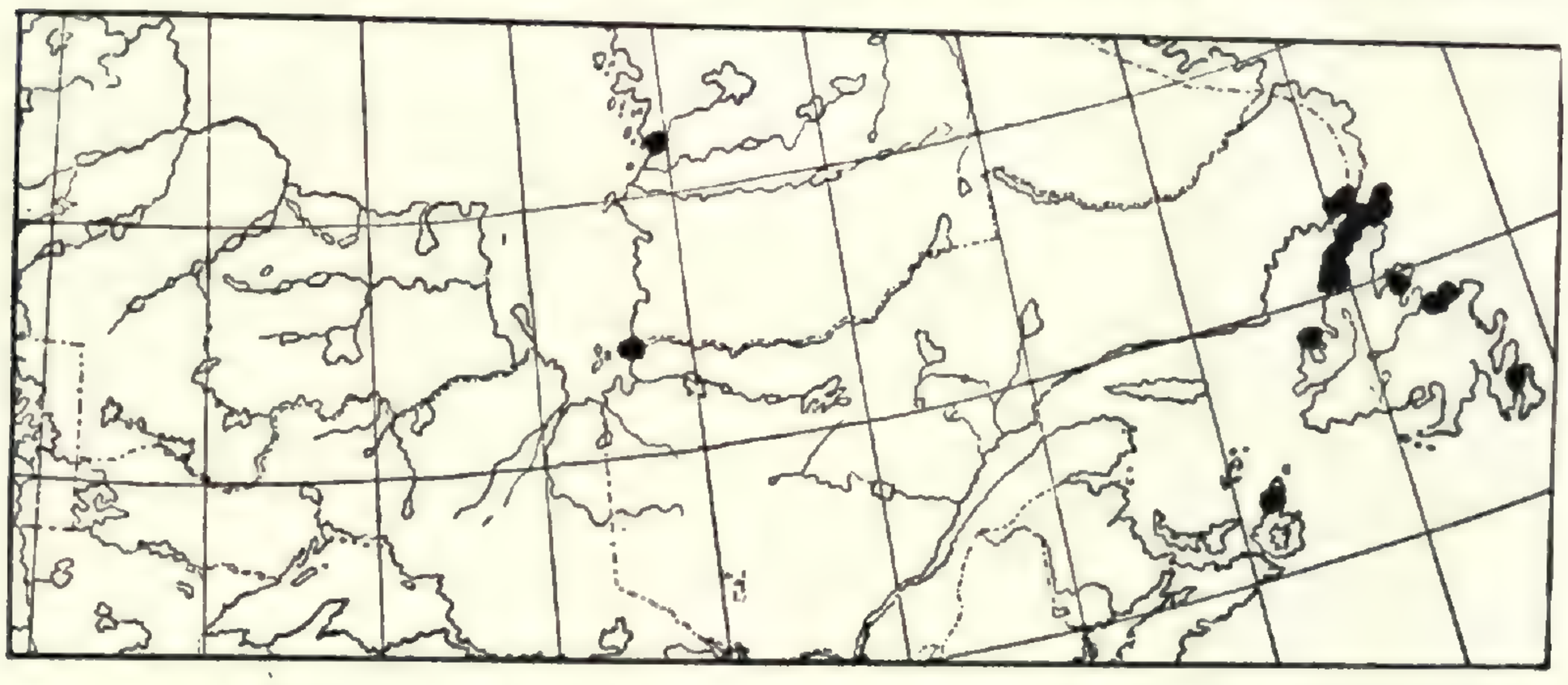
From *Draba crassifolia* (PLATE 294), which, of course, *D. Sornborgeri* suggests in its glabrous character, it is at once separated by its tall and usually branching and leafy stems; its broader leaves; its larger flowers, with sepals 2.5–3 mm. long (in *D. crassifolia* 1.5–2.3 mm. long); its petals 3.5–4 mm. long and 2–2.5 mm. wide (in *D. crassifolia* 2–3 mm. long, 0.7–1.2 mm. wide) and its more numerous (28–40) ovules and seeds (in *D. crassifolia* 16–20).

Although I have seen *Draba Sornborgeri* only from the slopes near Ramah, it is probably of more general occurrence in northern Labrador and is presumably on Baffin Island. This extention of range is suggested by Schulz's citation under *D. crassifolia*, var. *Parryi:* "L a b r a d o r: Cumberland Inlet (comm. W. H a n s [Cumberland Inlet or Cumberland Sound is in Baffin Island], Ramah (J. D. S o r n b o r g e r 1897, n. 61—20–24 August fruchtend, besonders luxuriös mit beblätterten Ästen, als *D. stenoloba*), Hebron (W e n c k 1851)."

12. D. NORVEGICA Gunner. *Cespitose* perennial, forming mats 0.3–1.5(–2) dm. broad, with slightly to freely branching caudex: *rosettes* few to very numerous, 1.5–3 cm. across; *their leaves* narrowly oblanceolate, oblong-lanceolate or narrowly obovate, 2–6 mm. broad, subacute or obtuse, entire or with 1–3 teeth on each margin, *hispid with numerous simple, bifurcate and stellate trichomes:* mature fruiting *stems* 0.1–2 dm. high, simple or forking, *hirsute especially below*, with

divergent simple and variously forked trichomes, with 1 (rarely 0)–5 *ovate hispid leaves* 3–10 *mm. broad*, with margins entire or 1–3-dentate: *racemes* in anthesis with the lower flowers often remote; *the primary ones in fruit* elongated to $^{1}/_{3}$–$^{6}/_{7}$ *the full height of the plant*, 5–25-flowered; *pedicels* short, often stellate-hirtellous, *the lowest in maturity* 1–5 *mm. long: sepals* oblong, obtuse, 1.8–2.6 *mm. long*, 1–1.5 *mm. broad: petals* white, 3–4.2 mm. long, 2–3 *mm. broad:* ovaries glabrous, with 14–28 ovules and very short style: *siliques oblong or oblong-lanceolate*, 5–9 mm. long, 2–3.8 *mm. broad*, acutish to obtuse, *with style* 0.2–0.5 *mm. long;* the *valves veiny* and glabrous or promptly glabrate: seeds 0.9–1.2 mm. long.—Fl. Norveg. ii. 106 (1772); O. E. Schulz in Engler, Pflanzenr. iv^{105}. 220 (1927). "An? *D.* pyrenaica" Oeder, Fl. Dan. i. fasc. iii. 6, t. cxliii. (1764), not L. (1753). *D. hirta*, var. *norvegica* (Gunner) Liljebl. Nov. Act. Reg. Soc. Sci. Ups. (1799) 56; DC. Syst. ii. 343 (1821) and Prodr. i. 169 (1824). *D. hirta*, β. *alpicola* Wahlenb. Fl. Lapp. 175, t. xi. fig. 1 (1812). *D. scandinavica* α. *legitima* Lindbl. Linnaea, xiii. 322 (1839). *D. laxa*, α. *legitima* Lindbl. l. c. 326 (1839). *D. rupestris*, β. *stricta* a. *lejocarpa* Lindbl. Bot. Notis. (1841) 221. *D. rupestris* Liebm. Fl. Dan. xiv. fasc. xli. 7, t. mmccccxxi. (1845) and many subsequent authors, not R. Br. (1812). *D. hirta*, δ. *incisa* Lange, Meddel. Grønl. iii^{1}. 43 (1880) and Fl. Dan. xvii. fasc. li. 9, t. mmmxxxiii. (1883). (For further citations see Schulz).—Northern Europe; Newfoundland, Cape Breton, Nova Scotia, southeastern Quebec and shores of Hudson Bay, Ungava and Quebec. NEWFOUNDLAND: St. Anthony Harbor, September 10, 1923, *A. G. Huntsman;* near seaward edge of Fishing Head, St. Anthony, *Abbe & Brooks*, nos. 366, 368; exposed rocks, crests of Castle Rock, Tilt Cove, *Fernald, Wiegand & Darlington*, no. 5460; turfy and rocky crests, Twillingate, *Fernald, Wiegand & Bartram*, no. 5459; cliffs, Exploits, Notre Dame Bay, *Waghorne*, no. 27; Red Rocks, Brigus, July 31, 1931, *A. M. Ayre;* damp pocket, rocky crests, Cape Dégrat, Quirpon Island, *Fernald & Long*, no. 28,402; dry slaty crests of hills, Little Quirpon, *Fernald & Long*, no. 28,401; crevices of trap cliffs, Sacred Island, *Fernald & Long*, no. 28,404; dry trap cliffs south of Ship Cove, Sacred Bay, *Fernald, Wiegand & Long*, no. 28,406 (mixed with *D. glabella*); crevices of trap cliffs, Anse aux Sauvages, Pistolet Bay, *Fernald, Wiegand & Long*, no. 28,405; shelves, crests and talus of diorite cliffs, Ha-Ha Point, *Fernald & Long*, no. 28,396; shelves, crests and talus of diorite cliffs, Ha-Ha Mountain, *Fernald & Long*, no. 28,400 in part; trap ledges, Piton Point, Ha-Ha Bay, *Wiegand, Gilbert & Hotchkiss*, no. 28,395; limestone ledges and barrens, Burnt Cape, Pistolet Bay, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, nos. 28,382, 28,384, 28,386, 28,388; limestone ledges, Schooner (or Brandy) Island, Pistolet Bay, *Pease & Long*, no. 28,390; dry limestone rock-barrens, Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 28,391; turfy seashore east of Big Brook, Straits of Belle Isle, *Pease & Griscom*, no. 28,377; dry

limestone ledges, Sandy (or Poverty) Cove, Straits of Belle Isle, *Fernald, Long & Dunbar*, no. 26,703; dry gravelly limestone barren, Savage Point, *Fernald, Wiegand, Pease, Long, Gilbert & Hotchkiss*, no. 28,374; turfy and shingly limestone shore, Capstan Point, Flower Cove and peaty pockets in limestone ledges, Nameless Point, Flower Cove, *Fernald, Long & Dunbar*, nos. 26,710, 26,711; turfy limestone shores and headlands, Flower Cove, *Fernald, Griscom & Gilbert*, no. 28,372, *Pease, Long & Gilbert*, no. 28,373; turfy limestone barrens, Deadman Cove, Straits of Belle Isle, *Wiegand, Gilbert & Hotchkiss*, no. 28,376; limestone barrens near Ice Point, St. Barbe Bay, *Wiegand, Gilbert & Hotchkiss*, no. 28,375; peaty or turfy pockets in limestone barrens, Brig Bay, *Fernald, Long & Dunbar*, no. 26,704; crests of dry limestone, Dog Peninsula, St. Margaret Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,411; limestone cliffs and ledges on western



MAP 12. American Range of DRABA NORVEGICA.

face of Bard Harbor Hill, *Wiegand, Gilbert & Hotchkiss*, no. 28,389; exsiccated spots in quartzite barren near summit, Bard Harbor Hill, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,392; wet escarpments on calcareous sandstone, western face, Bard Harbor Hill, *Fernald & Long*, nos. 28,409, 28,410; dry limestone cliffs and talus, western face, Doctor Hill, *Fernald & Long*, no. 28,408; dry gravelly limestone barrens, St. John Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,393; shaded shelves of limestone cliff, Crow's Head, St. John Bay, *Fernald, Long & Fogg*, no. 1743; turfy and gravelly upper border of limestone sea-beach, Eastern Point, St. John Bay, *Fernald, Long & Fogg*, no. 1745; turfy borders of limestone beach, Gargamelle Cove, *Fernald, Long & Fogg*, no. 1741; shaly sea cliff, north side, Keppel Island, *Abbe & Pease*, no. 363; turfy crevices and talus of trap sea-cliffs, French (or Tweed) Island, Bay of Islands, *Fernald, Long & Fogg*, no. 281. QUEBEC: calcareous cliffs, Blanc Sablon ("Labrador"), *Fernald, Wiegand & Long*, no. 28,413 (as *D. arabisans*); bare hillside about 3 miles north of Long Point, Brest, *E. C. Abbe*, no. 1262, as *D. megasperma*. UNGAVA: Richmond Gulf,

A. P. Low, no. 63,140; stony beach, 10 miles south of East Main, James Bay, *David Potter*, no. 549. NOVA SCOTIA: crevices of rocks, Big Intervale, Margaree, Cape Breton Island, *J. Macoun*, no. 18,987. All the preceding nos., unless otherwise noted, were distributed as *D. hirta* or as *D. rupestris*. PLATE 301; MAP 12.

Var. HEBECARPA (Lindbl.) O. E. Schulz. Flowering stems hispid to the summit: siliques permanently hispid with simple, bifurcate and sometimes stelliform trichomes.—O. E. Schulz in Engler, Pflanzenr. iv[105]. 222 (1927). *D. trichella* Fries, Novit. Fl. Suec. Mant. Alt. 40 (1839) and Summa Veg. Scand. i. 149 (1846) acc. to Schulz. *D. scandinavica*, β. *hebecarpa* Lindbl. Linnaea, xiii. 322 (1839). *D. rupestris* β. *stricta* b. *hebecarpa* Lindbl. Bot. Notiser (1841) 222 (1841). *D. rupestris*, * *trichella* (Fries) Nyman, Consp. i[1]. 53 (1878). *D. hirta*, * *trichella* (Fries) Hartm. Handb. Skand. Fl. ed. 11: 206 (1879). *D. hirta*, β. *hebecarpa* (Lindbl.) Strömfelt, Öfvers. Kgl. Vet.-Akad. Forhandl. 1884, no. 8: 110 (1885).—Northern Europe; Greenland; northwestern Newfoundland. NEWFOUNDLAND: turfy limestone barrens, Burnt Cape, Pistolet Bay, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, nos. 28,385, 28,387; upper border of limestone gravel-beach and shaded limestone escarpments, Burnt Cape, *Fernald & Long*, nos. 28,397, 28,398; turfy limestone barrens, Capstan Point, Flower Cove, *Fernald, Long & Dunbar*, no. 26,712, in part (mixed with glabrous-fruited plant); gravelly talus of limestone sea-cliffs and dry gravelly limestone barrens, Pointe Riche, *Fernald, Long & Fogg*, nos. 1742, 1744; all distributed as *D. hirta* L. (see discussion under *D. glabella*) or as *D. rupestris* R. Br.

Var. **pleiophylla**, var. nov. (TAB. 302), caulibus fructiferis 0.5–2.7 dm. altis; foliis caulinis 6–18; siliquis glabris.—Northwestern Newfoundland and adjacent Quebec Labrador. NEWFOUNDLAND: shelves, crests and talus of diorite cliffs, Ha-Ha Mountain, *Fernald & Long*, nos. 28,399, 28,400 (in part; mixed with typical *D. norvegica*); turfy limestone barrens, Burnt Cape, July 17, 1925, *Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss*, nos. 28,380 (TYPE in Gray Herb., some specimens misnumbered 20,380), 28,383; turfy limestone slopes near the sea, east of Big Brook, Straits of Belle Isle, *Fernald & Long*, no. 28,407; limestone escarpments on the Highlands northeast of Big Brook, *Pease & Griscom*, no. 28,378; peaty and turfy pockets in limestone barrens, Brig Bay, *Fernald, Long & Dunbar*, no. 26,705; dry gravelly limestone barrens, St. John Island, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,394; dry limestone cliffs and talus, western face of Doctor Hill, *Fernald &*

MAP 13. Range of DRABA NORVEGICA, var. PLEIOPHYLLA.

Long, no. 28,408[a]; gravelly limestone barrens near the sea, Eddy's (or Old Man's) Cove, St. John Bay, *Fernald, Long & Fogg*, no. 1748; turfy and gravelly shore, Back (or Bustard) Cove, *Fernald, Long & Fogg*, no. 1747; limestone ledges in dry clearing, Port au Choix, *Fernald, Long & Fogg*, no. 1746; turfy talus of limestone sea-cliffs at base of Pointe Riche, *Fernald, Long & Fogg*, no. 1750. QUEBEC ("LABRADOR"): limestone and calcareous sandstone terraces and crests, Blanc Sablon, *Fernald & Wiegand*, nos. 3460, 3461 (as *D. arabisans*, var. *orthocarpa*), 3462, 3463; *Fernald, Wiegand & Long*, no. 28,412 (transitional). All (unless otherwise noted) distributed as *D. hirta* L. (see discussion under *D. glabella*) or as *D. rupestris* R. Br. MAP 13.

Although European (PLATE 301, FIG. 1) and Greenland material of *Draba norvegica* has few (and sometimes no) cauline leaves, the plant of Newfoundland and adjacent Quebec varies from individuals (PLATE 301, FIGS. 2–5) inseparable from authentic European specimens and from the beautiful plate in Flora Danica (t. mmmxxxiii.) to a more leafy extreme (PLATE 302), such as seems to be unknown in Europe, var. *pleiophylla*. In this leafy extreme *D. norvegica* approaches a number of species of the Gulf of St. Lawrence area. The plant of the Shichshock Mountains (PLATE 303), however, is separable by its narrower cauline leaves, smaller flowers, narrow siliques and longer pedicels. The stout *D. laurentiana* (PLATES 304, 305), occurring in much the same area as *D. norvegica* and its var. *pleiophylla*, is coarser throughout, with the foliage essentially lacking the simple trichomes which characterize the leaves of *D. norvegica*, usually more numerous leaves, larger flowers in relatively shorter racemes and more numerous seeds. In some of its forms *D. norvegica* approaches *D. glabella*, one of the commonest and most variable species about the Gulf of St. Lawrence; but *D. glabella* (PLATE 307) mostly lacks the simple pubescence on leaves and stems, being stellate-pannose.

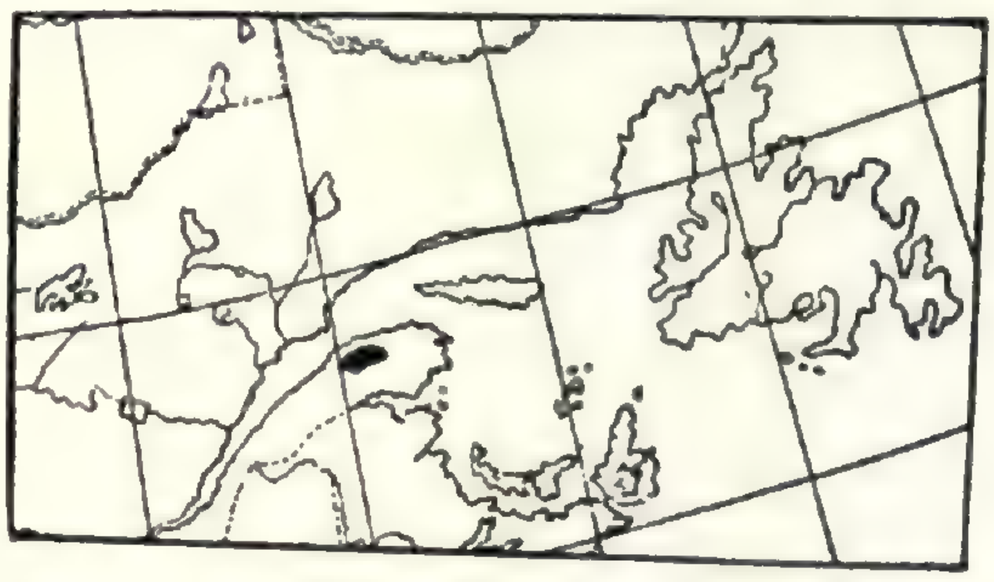
As already noted, the distinctions between the larger plants (PLATE 293) of *Draba rupestris* R. Br. (1812) and the smaller plants of *D. norvegica* Gunner (1772) with 1 cauline leaf (or with this lacking) are not wholly satisfactory. *D. rupestris* is more delicate or slender; but I anticipate the merging of the two when the latter extreme has been more collected and studied on our northern barrens and shores. We should then have a species characterized by very narrow and hispid rosette-leaves, hispid stems, and hispid, ovate cauline leaves varying from 0 to 18, awkward for key-making, to be sure, but rather typical of the vagaries of *Draba*. If, furthermore, we were to abandon the characters of pubescence now relied upon, *D. norvegica*, as the oldest

name, would be applicable likewise to a large series of stellate-pannose plants of the boreal regions now maintained as distinct species.

Schulz, who recognized no true *Draba norvegica* nor its pubescent-fruited var. *hebecarpa* from North America, cited a single collection (PLATE 303, FIG. 1) from the Shickshock Mts. of Gaspé (*Dodge, Griscom & Pease*, no. 25,773) as belonging to his *D. norvegica*, var. *laxa* (Lindbl.) O. E. Schulz, of the Dovre Alps of Norway. Lindblom's *D. laxa α. legitima*, upon which Schulz's variety was based, was, apparently, not essentially different from *D. norvegica* Gunn. and described "scapis 1–2-phyllis." Lindblom explicitly cited *D. norvegica* "(descr. vitiosa)" and also cited the identical plate upon which Gunner had based *D. norvegica:* "*Fig.* Dr. an pyrenaica *Fl. Dan. t.* 143 (mala)." This illustration, although properly characterized by Lindblom as "mala," shows no cauline leaves and the Flora Danica plate of it cited by Schulz for *D. norvegica*, var. *laxa* has 0–4 cauline leaves. The sheet of the Gaspé plant (no. 25,773) preserved in the Gray Herbarium has more numerous (8–13) and narrower cauline leaves, much smaller flowers and more slender siliques on longer pedicels than in *D. norvegica* and, consequently, than in *D. laxa*, which was based in part on *D. norvegica.* It seems to represent an endemic species, which I am calling *D. clivicola.*

13. D. **clivicola**, sp. nov. (TAB. 303), planta humifusa stragula 3–15 cm. diametro formans; caudiculorum ramis ramulisque pallidis inferne foliis emortuis plus minusve fibrillosis squamatis, superne foliis rosulatis cespitem laxum 1.3–3 cm. diametro formantibus; foliis rosulatis lineari-oblanceolatis acutis 0.4–1.5 cm. longis 1–5 mm. latis integris vel marginibus utrinque 1–3-incisis plus minusve hirtellis pilis simplicibus furcatis stellatisque; caulibus floriferis filiformibus flexuosis simplicibus vel ramosis, fructiferis 0.3–3 dm. altis basi hirtellis; foliis caulinis 3–13 (av. 7), lanceolatis vel anguste ovatis 0.5–1.7 cm. longis 1.5–6 mm. latis hispidulis inciso-serratis vel integris; racemis floriferis confertis fructiferis elongatis laxis 2–13 cm. longis 5–19-floris; pedicellis imis fructiferis 4–10 mm. longis, saepe bracteatis; sepalis oblongis 1.6–2 mm. longis 0.4–0.9 mm. latis glabris vel sparse hirtellis; petalis lacteis anguste obovatis 2.8–4 mm. longis 1–1.5 mm. latis; antheris 0.3 mm. longis; ovariis glabris 16–26-ovulatis; siliculis glabris linearibus vel lineari-lanceolatis stigmato capitato coronatis 7–12 mm. longis 2–2.5 mm. latis, valvis obsolete reticulato-venosis; seminibus a funiculis 0.2 mm. longis pendulis ellipticis 1–1.3 mm. longis.—Shickshock Mts., Matane Co., QUEBEC: wet hornblende-schist at base of Big Chimney, altitude 400–600 m., Mt. Mattaouisse, July 22, 1922, *Fernald & Pease*, no. 25,096 (distributed as from "Mt. Logan"); schistose talus and wet shelves at base

of Big Chimney, July 10, 1923, *Dodge, Griscom & Pease*, no. 25,773 (TYPE in Gray Herb.); cold schistose walls at head (alt. 1070 m.) of Big Chimney, July 14, 1923, *Fernald, Griscom, Pease & Smith*, no. 25,789; cold chimneys in the schist at about 900–1000 m. alt., south of Fernald Pass, Mt. Mattaouisse, August 20, 1923, *Fernald & Smith*, no. 25,777; talus of mica-schist, chimney east of Razorback Ridge (alt. 850–1000 m.), Mt. Logan, July 13, 1923, *Pease & Smith*, no. 25,774; schistose talus at about 800–950 m. alt., Pease Basin, between Mts. Logan and Pembroke, July 13, 1923, *Pease & Smith*, no. 25,771 (exceptionally broad-leaved, cauline leaves to 6 mm. broad); cliffs and chimneys at about 800–1050 m. alt., east of Big Cascade, Pease Basin, between Mts. Logan and Pembroke, July 16, 1923, *Dodge & Pease*, no. 26,130; dry talus and ledges of green schists, at about 900–1125 m., Hanging Valley, Mt. Pembroke, July 16, 1923, *Griscom & Pease*, no. 25,775, 25,776, August 24, 1923, *Fernald & Smith*, no. 25,778. All distributed as *D. rupestris*. MAP 14.

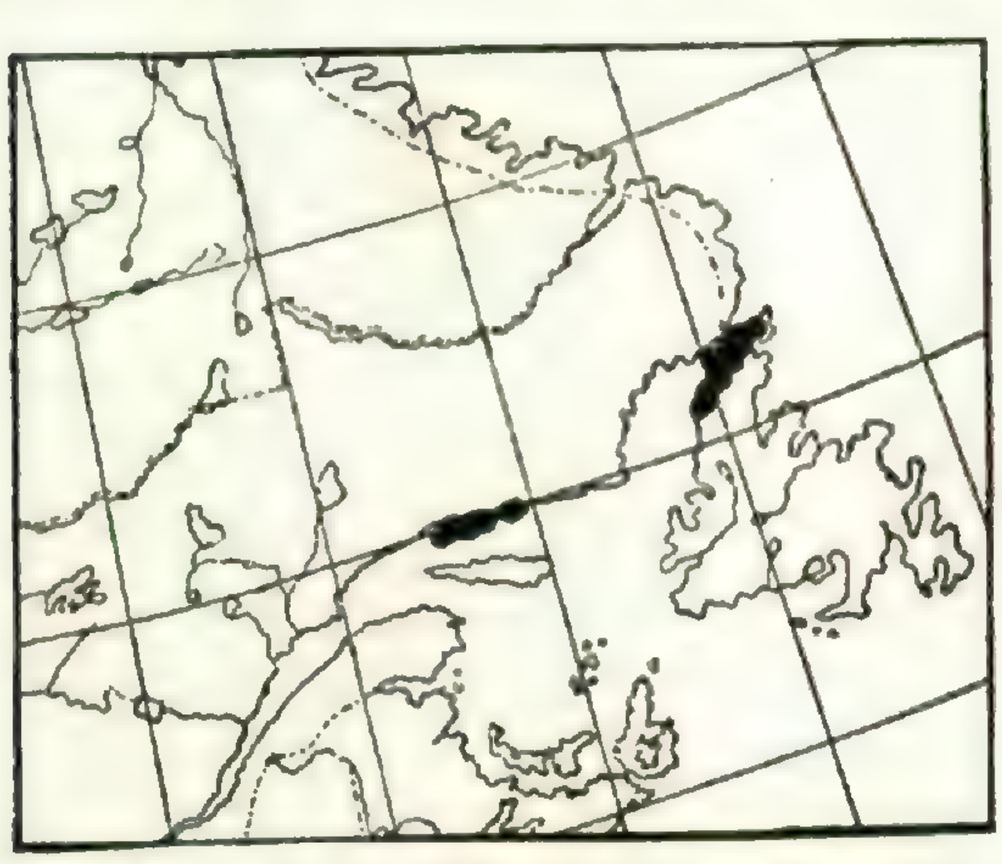


MAP 14. Range of DRABA CLIVICOLA.

Draba clivicola, which was distributed as *D. rupestris* R. Br., differs quite obviously from that species in its very leafy stems, *D. rupestris* being typically scapose. Its reference to *D. norvegica* by Schulz has been noted in the discussion of the latter species; but it is sufficiently clear from that in its narrower cauline leaves, smaller flowers, more slender fruit and longer lower pedicels. So far as yet known, it is confined to the somewhat calcareous schistose upper slopes of the Mt. Logan region in Gaspé, a peculiarly notable area, where *D. clivicola* is associated with other endemic or near-endemic species: *Festuca prolifera* (Piper) Fern.,[1] *Draba Allenii* (see above), *Saxifraga gaspensis* Fern.[2] and *Vaccinium nubigenum* Fern.;[3] and such species, separated by hundreds or thousands of miles from their specific allies, as *Draba nivalis* Liljebl., *Potentilla emarginata* Pursh,[4] *Euphrasia Williamsii* Robinson, *Campanula uniflora* L.,[5] *Arnica Louiseana* Farr[6] and *Senecio resedifolius* Less.[7]

[1] RHODORA, XXXV. 133, map 14 (1933).
[2] RHODORA, XIX. 141 (1917).
[3] See RHODORA, XXXV. 279, map 23 (1933).
[4] The plant identified and reported as *P. fragiformis* Willd. in Mem. Amer. Acad. XV. 280 (1925) is, according to the late Dr. Malte, *P. emarginata*.
[5] See Mem. Amer. Acad. XV. 338 (1925).
[6] See RHODORA, XXXV. 369, map 30 (1933).
[7] See RHODORA, XXVI. 113 (1924); also Mem. Amer. Acad. XV. 260, and map 29, p. 259 (1925).

14. D. **laurentiana**, sp. nov. (TABS. 304, 305), planta humifusa stragula 3–15 cm. diametro formans; caudiculorum ramis ramulisque albescentibus nitidis inferne foliis emortuis fibrillosis squamatis, superne foliis rosulatis cespitem 1.5–7 cm. diametro formantibus; foliis rosulatis cuneato-oblanceolatis 0.7–3.8 cm. longis 4–9 mm. latis crassis firmis acutis vel subacutis vel marginibus utrinque 1–3-dentatis stellato-pannosis; caulibus floriferis crassis simplicibus vel sparse ramosis, fructiferis 1–3.5 dm. altis imis piloso-hirsutis pilis simplicibus furcatis stellatisque admixtis; foliis caulinis (3) 6–25 (av. 10) oblongis plerumque 1–3 cm. longis 3–11 mm. latis argute 2–4-serrato-dentatis stellato-pannosis; racemis floriferis corymbiformibus fructiferis laxe elongatis 3–15 cm. longis 6–30-floris; pedicellis imis fructiferis 1.5–6 mm. longis ebracteatis vel rare bracteatis; sepalis ovalibus vel late oblongis late albido-marginatis 2.3–3 mm. longis 1.3–2.3 mm. latis; petalis lacteis late obovatis emarginatis 4.5–5 mm. longis 2.5–4 mm. latis; antheris 0.4 mm. longis; ovariis glabris 20–40-ovulatis; siliculis glabris oblongis ellipticis vel oblongo-lanceolatis planis vel tortis stylo brevissimo (0.1–0.4 mm. longo) coronatis 5–14 mm. longis 2–4 mm. latis, valvis valde reticulato-venosis vel rugulosis; seminibus a funiculis 0.3 mm. longis pendulis ellipticis 1–1.3 mm. longis.—Shores of the Gulf of St. Lawrence and Straits of Belle Isle, Newfoundland and eastern Quebec. NEWFOUNDLAND: limestone ledges, Schooner (or Brandy) Island, Pistolet Bay, July 18, 1925, *Pease & Long*, no. 28,359; dry rocky and gravelly limestone barrens, Cape Norman, July 18, 1925, *Wiegand, Griscom & Hotchkiss*, no. 28,360; turfy seashore east of Big Brook, July 15, 1925, *Pease & Griscom*, no. 28,357; Green Island, Straits of Belle Isle, July 24, 1925, *Griscom*, no. 28,364; fields and meadows, Flower Cove, July 12, 1920, *M. E. Priest*, no. E1; turfy limestone shore, Capstan Point, Flower Cove, July 10, 1925, *Fernald, Griscom & Gilbert*, no. 28,355; limestone ledges and gravel near the sea, St. Barbe, August 4, 1924, *Fernald, Long & Dunbar*, no. 26,713; turfy upper margin of limy gravel beach, Brig Bay, August 6, 1924, *Fernald, Long & Dunbar*, no. 26,714; turf overlying limestone, Grassy Island, St. John Bay, August 5, 1929, *Fernald, Long & Fogg*, no. 1731 (TYPE in Gray Herb.). QUEBEC: "Labrador," *Martin;* sur un îlôt de calcaire, riche en guano, Îslets de la Baie à Jean, 25 juillet, 1924, *Victorin & Rolland*, no. 18,256 (as *D. arabisans*); sur les rochers calcaires, Île Ste. Génévième, Mingan, 17 juilliet, 1924, *Victorin & Rolland*, no.



MAP 15. Range of DRABA LAURENTIANA.

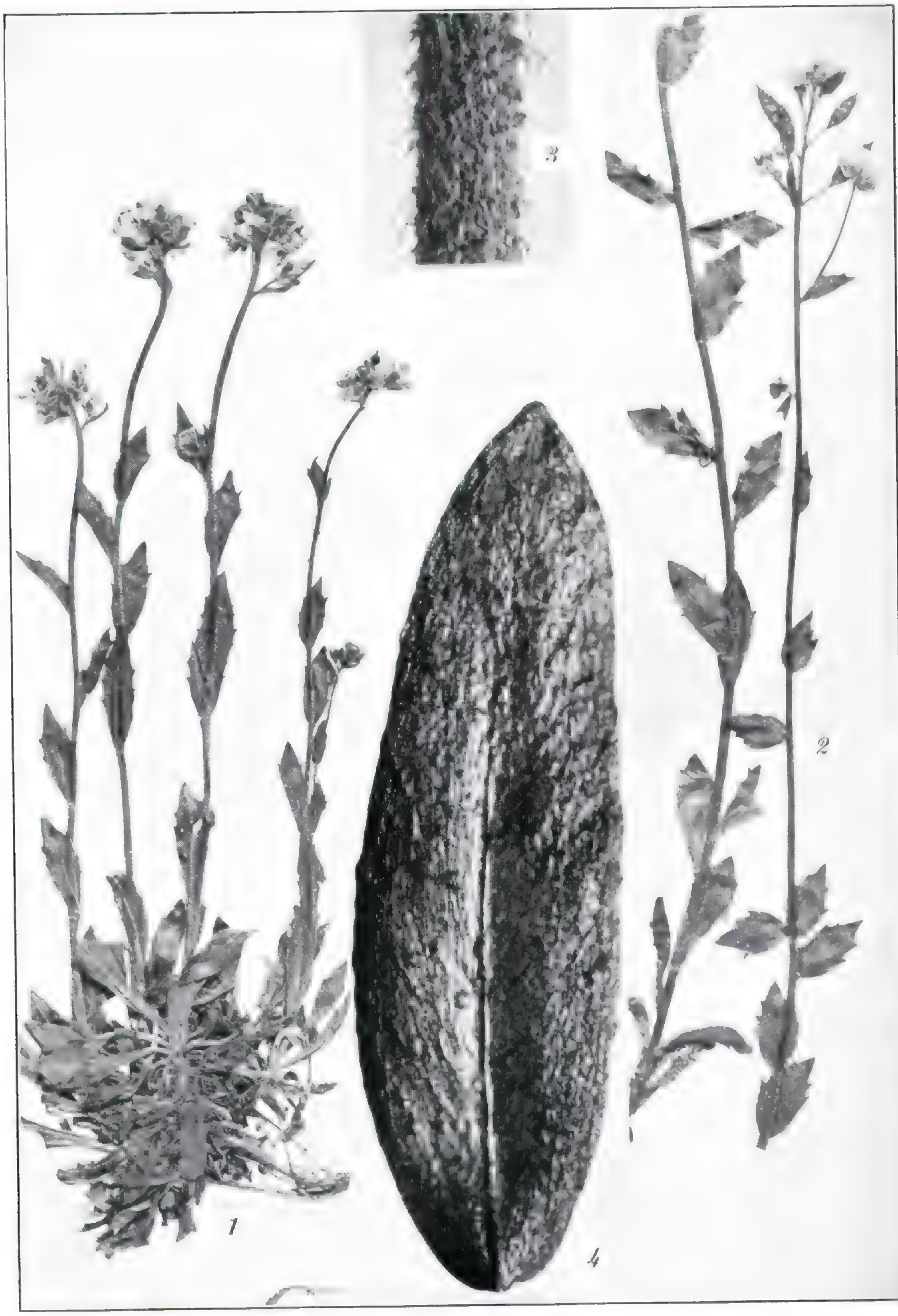
Draba incana (var. confusa): fig. 1, small fruiting plant, from Archipel de Kécarpoui, Quebec; fig. 2, dwarf plant, from Percé, Quebec (isotype of var. *conica*); fig. 3, flowering plant, from Cow Head, Newfoundland; fig. 4, small fruiting plant, from Newfoundland; fig. 5, slender plant, from same station as fig. 2; fig. 6, leafy plant, from Baie à Jean, Quebec; all × 1.

DRABA SORNBORGERI, n. sp.: FIG. 1, portion of fruiting plant, × 1, from Ramah, Labrador (TYPE); FIG. 2, flower, × 10, from Ramah; FIG. 3, valve, × 10, from the TYPE.
D. CRASSIFOLIA, var. PARRYI: FIGS. 4 and 5, flowering and fruiting plants, × 1, from Gray's Peak, Colorado.

DRABA NORVEGICA: FIG. 1, small fruiting plant, × 1, from Norway; FIG. 2, dwarf flowering plant, × 1, from Newfoundland; FIG. 3, small flowering plant, × 1, from Newfoundland; FIG. 4, fragment of flowering plant, × 1, from Newfoundland; FIG. 5, fragment of fruiting plant, × 1, from Newfoundland; FIG. 6, tips of rosette-leaves, × 10, from Newfoundland.

DRABA NORVEGICA, var. PLEIOPHYLLA, n. var.: FIG. 1, portion of fruiting plant, × 1; FIG. 2, flowering plant, × 1 (TYPE); FIG. 3, rosette-leaves and lowest internode, × 10; FIG. 4, silique, × 10; all from Newfoundland.

DRABA CLIVICOLA, n. sp.: FIGS. 1 and 2, flowering and fruiting plants, × 1 (TYPE); FIG. 3, portion of internode, × 10; FIG. 4, tip of rosette-leaf, × 10; 5, flowers, × 10; FIG. 6, valve of ripe silique, × 10; all from Shickshock Mts., Quebec.



DRABA LAURENTIANA, n. sp.: FIG. 1, small flowering plant, × 1, from Newfoundland; FIG. 2, portion of tall flowering plant (divided), × 1, from Archipel de Mingan, Quebec; FIG. 3, portion of internode, × 10, from Newfoundland (TYPE); FIG. 4, valve of ripe silique, × 10, from the TYPE.

DRABA LAURENTIANA, n. sp.: FIG. 1, portion of fruiting plant, × 1, from the TYPE; FIG. 2, portion of basal rosette, × 10, from the TYPE; FIG. 3, flower, × 10, from Newfoundland.

DRABA PYCNOSPERMA: FIG. 1, small fruiting plant from Île Bonaventure, Quebec; FIG. 2, rosette-leaves, × 10, from same station; FIG. 3, portion of internode, × 10, from Percé, Quebec; FIG. 4, septum and seeds, × 10, from Percé; FIG. 5, valve, × 10, from Percé.

DRABA GLABELLA: FIG. 1, flowering plant, × 1, from Newfoundland; FIG. 2, flowering plant, × 1, from Labrador; FIG. 3, fruiting stems, × 1, from near Nain, Labrador (type region of *D. Henneana*); FIG. 4, portion of basal rosette, × 10, from Newfoundland; FIG. 5, portion of internode, × 10, from Labrador; FIG. 6, tip of silique, × 10, from Newfoundland.

Draba glabella: fig. 1, type, × 1, in Herb. Brit. Mus. (photograph from the Keeper, Mr. J. Ramsbottom); fig. 2, type of *D. Henneana*, × 1, in Herb. Bot. Mus. Berlin-Dahlem (photograph by *L. B. Smith*, from original specimen loaned by the Curator, Professor Johannes Milbraed); fig. 3, type of *D. daurica*, × 1, in Herb. De Candolle, Genève (photograph presented by Dr. Alfred Becherer and Mr. J. F. Macbride).

DRABA GLABELLA, var. ORTHOCARPA: FIG. 1, TYPE, × 1, from Bic, Quebec; FIGS. 2 and 3, septum with seeds, and valve, × 10, from TYPE.

DRABA GLABELLA, var. BRACHYCARPA: FIG. 1, fruiting stems, × 1, from Greenland; FIG. 2, flowering plant, × 1, from Greenland; FIGS. 3 and 4, silique and septum with seeds, × 10, from fig. 2.

DRABA GLABELLA, var. MEGASPERMA: FIG. 1, portion of flowering plant, from Archipel Ouapitagone, Quebec; FIG. 2, portion of fruiting plant, × 1, from Archipel de Mingan, Quebec; FIG. 3, portion of fruiting plant, × 1, from Forteau, Labrador; all × 1.

Draba glabella, var. megasperma, details from the type, × 10, from Paspébiac, Quebec: fig. 1, rosette-leaves; fig. 2, portion (fractured, overripe) of lowest internode; figs. 3 and 4, valve, and septum with seeds.

DRABA MCCALLAE: FIG. 1, flowering plant (TYPE), × ½, from Alberta; FIG. 2, fruiting stem, × ½, from Alberta; FIG. 3, rosette-leaves, × 10, from Alberta; FIG. 4, lower internode, × 10, from Alberta; FIG. 5, flower, × 10, from TYPE; FIG. 6, silique, × 10, from fig. 2.

18,253; sur le cailloutis calcaire, Côté du Large, Île Ste. Généviève, 9 août, 1925, *Victorin & Rolland,* 21,477; rivages calcaires, Île Nue, Mingan, 29 juillet, 1926, *Victorin & Rolland,* no. 24,863; sur le cailloutis calcaire, Île à la Vache Marine, Mingan, 16 juillet, 1924, *Victorin & Rolland,* no. 18,251, as *D. arabisans;* sur les corniches calcaires, Île Quin, Mingan, 28 juillet, 1924, *Victorin & Rolland,* no. 18,244, as *D. arabisans,* var. *canadensis* (small bushy-branched and small-fruited extreme); sur les corniches calcaires, Île du Fantome, Mingan, 28 juillet, 1924, *Victorin & Rolland,* no. 18,246; sur le calcaire couvert de guano, Îlets Perroquets, Mingan, 5 août, 1924, *Victorin & Rolland,* no. 18,252, as *D. arabisans;* without statement of locality, Anticosti, June 26, 1861, *Hyatt, Shaler & Verrill.* Unless otherwise stated, distributed as *D. megasperma.* MAP 15.

Draba laurentiana is one of the coarser species of eastern America. Although confused in the herbarium with *D. glabella* Pursh, var. *megasperma* (Fern. & Knowlton) Fern. (PLATES 311, 312) and sometimes with *D. arabisans* Michx. (PLATES 314, 315), it stands apart from them both in the abundant spreading and simple pubescence of the lower internodes of the coarse flowering stems; *D. megasperma,* which is better treated as a large extreme of *D. glabella* Pursh, having the stems coarsely stellate-pannose, *D. arabisans* having them more finely stellate. The cauline leaves of *D. laurentiana* are commonly very numerous, usually 6–25 (average 10), those of *D. glabella* and its varieties few, 0–8, very rarely to 13 (average 4), and in *D. arabisans* they are much more narrowed at base and only 3–12 in number. The flowers of *D. laurentiana* are very large and the siliques distinctly rugose-veiny, with almost no style, while the silique of *D. arabisans* is veinless and long-styled. *D. glabella,* var. *megasperma,* in its largest development, is very similar to the less leafy plants of *D. laurentiana* and the two probably cross. In view of the marked difference in the pubescence of their lower internodes they are here treated as different species. It may later seem wiser to unite them as varieties of one variable species.

In northwestern Newfoundland and on the Mingan Islands *Draba laurentiana* has its greatest development, the material thought to be from Anticosti possibly having been actually collected elsewhere. In sharing the Gulf coast of Newfoundland and the Mingan Islands and, though only locally or doubtfully, Anticosti, it becomes one of a large series of species of similar occurrence: *Listera borealis* Morong, *Lesquerella Purshii* (Wats). Fern., *Arctostaphylos rubra* (Rehder & Wilson) Fern., *Arnica chionopappa* Fern., *Taraxacum laurentianum*

Fern., etc., which are each found on two or more of these segregated areas.

15. D. PYCNOSPERMA Fern. & Knowlt. Cespitose *perennial*, forming close or loose mats 0.2–2.5 dm. across: the pale slender mostly forking *caudices* retaining shreds of dead old leaves and *often with persistent bases of stellate trichomes*, ending in prostrate rosettes 1.5–10 cm. across: *rosette-leaves cuneate-spatulate to narrowly rhombic*, 0.7–5 cm. long, 2–15 mm. broad, entire or shallowly 1–3-dentate above the middle on each side, *finely and closely stellate-pannose: flowering stems* simple or with long ascending branches, in fruit 0.5–3.3 dm. high, very slender, *loosely to densely stellate-pubescent, often with admixture of forking and simple trichomes: cauline leaves* 1–4, *oblong to ovate*, 0.5–3 cm. long, 0.2–2 *cm. broad*, entire or 1–3-dentate on each margin, *sparsely hirsute* with simple, bifurcate and stellate trichomes *or glabrate: racemes in fruit very slender and lax*, 0.15–2 dm. long, 0.6–1.8 *cm. in diameter*, with pedicels mostly 3–12 mm. apart, with 5–40 siliques: pedicels finally loosely ascending, filiform, the lower 2–8 mm. long: *sepals oblong*, glabrous or hispid, 1.5–2 *mm. long*, 1 *mm. broad; petals white*, obovate, 2.7–3 *mm. long*, 2 *mm. broad:* anthers 0.2–0.3 mm. long: ovary glabrous: *siliques plump, compressed-ovoid, -ellipsoid or -oblong*, 2.5–10 mm. long, 1.8–3.3 mm. broad, *glabrous, with very short* (0.1–0.4 mm. long) but definite *style: seeds* 10–32, *closely imbricated and often turned oblique to the septum*, 1–1.4 mm. long.—RHODORA, vii. 67, t. 60, figs. 13–15 (1905); Ibid. xxviii. 201 (1926). *D. canadensis*, var. *pycnosperma* (Fern.) O. E. Schulz in Engler, Pflanzenr. iv[105]. 277 (1927).—Highly localized on limestones of northwestern Newfoundland and of eastern and northern Gaspé County, Quebec. NEWFOUNDLAND: dry limestone cliffs and talus, western face of Doctor Hill, *Fernald & Long*, no. 28,369. QUEBEC: dans l'Anse-à-l'Indien, sur les calcaires, Cap Gaspé, *Victorin, Rolland, Brunel & Rousseau*, nos. 17,379, 17,380, as *D. arabisans*, var. *orthocarpa;* wet limestone cliffs, Le Coulé, Percé, August 17, 1904, *Collins, Fernald & Pease* (*Pease*, no. 5450); crest of calcareous sea-cliffs, Cap Barré, Percé, August 16–20, 1904, *Collins, Fernald & Pease* (*Pease*, nos. 7361, 7359); sommet des "Trois Soeurs," Percé, *Victorin, Rolland, Brunel & Rousseau*, no. 17,375; dry calcareous rock, summit of Mt. Ste. Anne, Percé, July 24, 1905, *Williams, Collins & Fernald;* in a cold dark cave, near permanent snow, Mt. Ste. Anne, July 24, 1905, *Williams, Collins & Fernald;* Bonaventure conglomerate

MAP 16. Range of DRABA PYCNOSPERMA.

(calcareous), summit of Mt. Ste. Anne, *Fernald & Collins*, nos. 1071, 1072; sur les faces nues du conglomérate Bonaventure, vers 350 m. d'alt., Mt. Ste.-Anne, *Victorin, Rolland, Brunel & Rousseau*, no. 17,387; dry cliffs, Mt. Ste. Anne, *Pease*, nos. 19,239, 20,242; crests of calcareous sea-cliffs, Cap Blanc, Percé, August 17, 1904, *Collins, Fernald & Pease*, TYPE collection (*Pease*, no. 5437); steep face of Cap Blanc, *Collins & Fernald*, no. 94; Bonaventure conglomerate (calcareous) sea-cliffs, Bonaventure Island, *Fernald & Collins*, nos. 1073, 1074; blocs de conglomérat, Île Bonaventure, *Victorin, Brunel & Rousseau*, nos. 17,376, 17,377; falaîse de grès, Tourelle, *Rousseau*, no. 31,150. PLATE 306; MAP 16.

In its very plump siliques with crowded and usually obliquely-imbricated seeds and in its small flowers *Draba pycnosperma* should not be confused with any other species. Although Schulz reduces it to varietal rank, as *D. canadensis*, var. *pycnosperma*, it is very evident that he has completely misunderstood *D. canadensis*. *D. canadensis* Brunet (PLATE 315, FIGS. 3, 4 and 6) is a rather unimportant variation of *D. arabisans* Michx., differing from typical *D. arabisans* only in having slightly broader and flatter siliques (ovate and flat rather than lanceolate and twisted). It has all the technical characters of *D. arabisans:* oblanceolate entire or sparingly toothed rosette-leaves; flowering stems merely pannose-stellate (without elongate simple and bifurcate trichomes); cauline leaves narrow, merely stellate-pinnose (not hirsute) on the surfaces and rather numerous (6–9); pedicels divergent; sepals 2.5–3 mm. long; petals 4 mm. long; fruiting racemes compact, with subapproximate fruits, subcorymbiform to short-cylindric, 1.5–5 cm. long; siliques very flat; seeds not imbricated, lying flat against the septum. In contrast *D. pycnosperma* has broader rosette-leaves, flowering stems with simple and bifurcate trichomes mixed with the stellate ones, the 1–4 round-based cauline leaves often sparsely hirsute, the pedicels more ascending and relatively shorter, the sepals and petals definitely smaller; the fruiting racemes very slender and much elongate, with fruits becoming remote, the siliques very plump (½–⅔ as thick as broad), the crowded or imbricated seeds usually turned oblique to the rachis. The reasons for Schulz's reduction of *D. pycnosperma* to *D. canadensis* were, obviously, his unfamiliarity with the latter plant, coupled with his reliance solely upon the inconstant outline of the silique:

*Siliculae acutae, raro acuminatae.
†Semina 1–1,2 mm longa. Siliculae acutae.
. . . . . .
. . . . . .
††Semina vix 1 mm longa. Siliculae acuminatae. . . . 205. *D. arabisans.*

**Siliculae obtusiusculae vel rotundatae.

. . . . . .

††Siliculae parvae, 2,5–7 mm longae, ovoideae, apice rotundatae. . . . . 208. *D. canadensis.*

It will be noted that by ascribing to *D. canadensis* in his key "ovoid" (rather than flat and ovate) siliques Schulz was giving it a fundamental character of *D. pycnosperma.* Incidentally, Schulz made it clear that he did not personally know *D. canadensis,* his diagnosis of it, between quotation marks, being a latinization of the brief varietal description of *D. arabisans,* var. *canadensis* published by Knowlton and myself, with the siliques correctly described "Siliculae . . . elliptico-ovatae"; whereas *D. pycnosperma,* of which I had sent duplicates to Berlin, was accurately described: "Racemus . . . fructifer elongatus, laxus. Siliculae . . . . ovoideae, . . . valvis convexis subinflatae . . . . . Semina . . . dense conferta."

Draba pycnosperma, known only from the region of Cape Gaspé and Percé, at the tip of the Gaspé Peninsula, where it is a very common and definite species, and from a single cliff-wall farther west and a single wall of the Doctor Hills of northwestern Newfoundland, has the peculiarly restricted relic-localization which characterizes most of the endemics of the region. In many cases, however, the endemics of the shores of the Gulf of St. Lawrence are found over extensive areas of either Gaspé, Anticosti, the Mingan Islands or western Newfoundland and also on one or another of the other areas (sometimes also the Magdalen Islands or St. Paul Island): such plants as *Draba laurentiana* (of western Newfoundland, the Côte Nord, the Mingan Islands and, perhaps, Anticosti), *Amelanchier Fernaldii* Wieg. (of western Newfoundland, Gaspé, the Magdalen Islands and St. Paul Island), *Primula laurentiana* Fern. (of Newfoundland, southern Labrador, the Mingan Islands, Anticosti, Gaspé and adjacent areas and the Magdalen Islands, with outlying colonies westward in Quebec and southward in Nova Scotia and Maine) and *Gentiana nesophila* Holm (of western Newfoundland, the Mingan Islands and Anticosti). But *D. pycnosperma,* although dominant at the extreme eastern end of the Gaspé Peninsula (Percé region, Bonaventure Island and Cape Gaspé), is otherwise known on the Gaspé Peninsula only from a single station more than 100 miles to the west; it is quite unknown from Anticosti and the Mingan Islands; and in Newfoundland it has been found only on a single cliff.

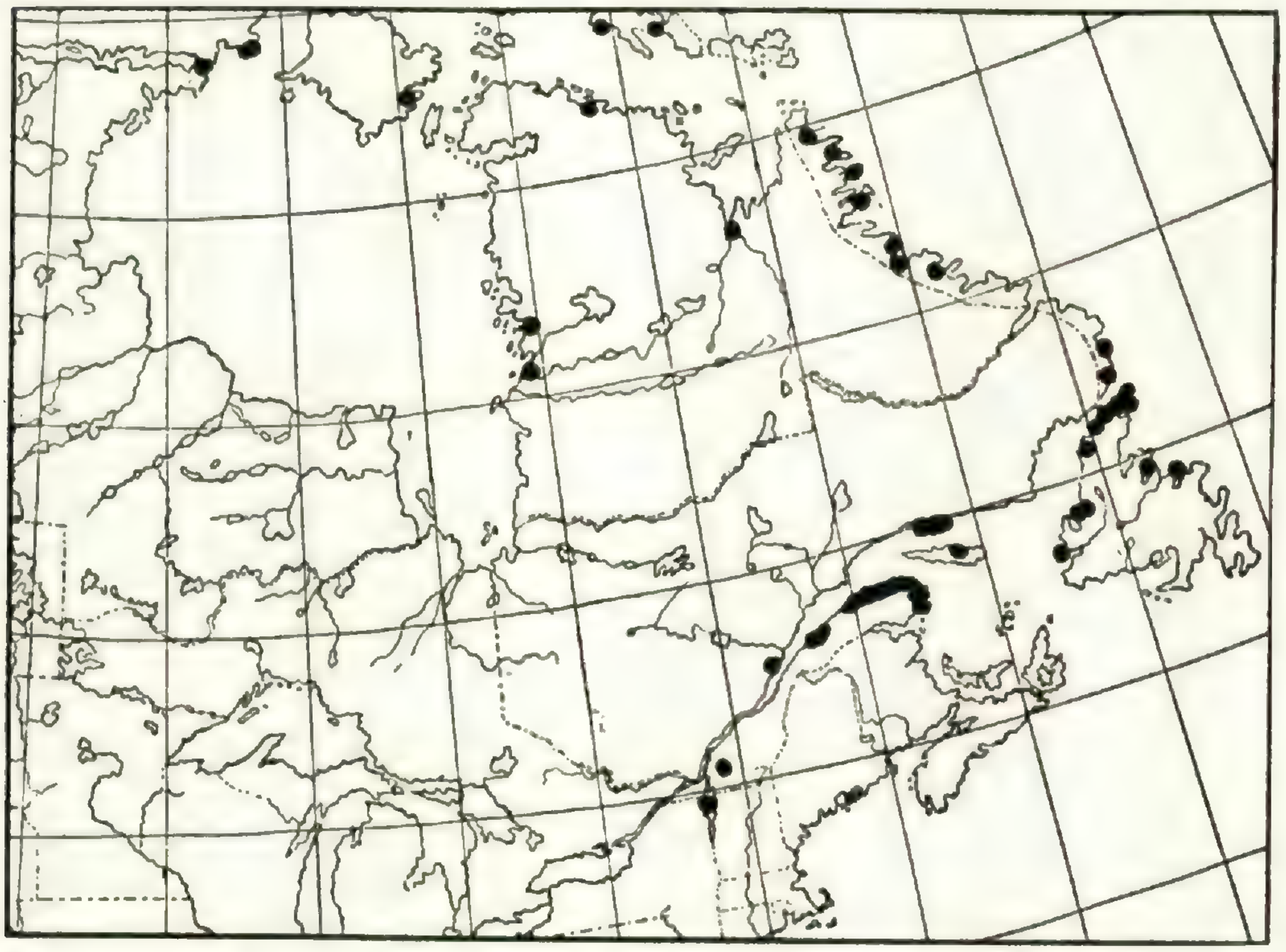
16. D. GLABELLA Pursh. Loosely to densely cespitose *perennial*, forming mats 0.2–2 dm. across: the pale slender mostly forking caudices retaining shreds of dead leaves, ending in depressed rosettes 1.5–8 dm. across: *rosette-leaves* cuneate-oblanceolate, oblanceolate-oblong or spatulate, dentate to entire, attenuate to the petiolar base, 0.7–4.5 cm. long, 2–10 mm. broad, *closely stellate-pannose*, in age sometimes glabrate: *flowering stems* simple to freely forking, 0.5–4 dm. high, *stellate-pannose*, only rarely with a few simple spreading trichomes, often glabrate at summit: *cauline leaves* 1 (rarely 0)–14, *ovate to oblong, tapering to rounded or subamplexicaul at base*, 1–3(–5)-dentate on each side or sometimes entire, 0.8–4 cm. long, 2–12 mm. wide, more or less stellate-pilose or glabrate: *racemes* corymbiform in flower, in fruit elongate, *usually lax*, the principal ones 0.3–1.5 dm. long with 5–35 subdistant siliques: *pedicels finally ascending, stoutish* (rarely very slender), *the lowest* 1–6 (rarely –8 or even 10) *mm. long: sepals* oblong, pilose to glabrous, 2–3 *mm. long*, 1–2 *mm. broad*, white-margined: *petals white*, broadly obcordate, unguiculate, 3–5.5 *mm. long*, 2–4 *mm. broad:* anthers about 0.4 mm. long: *siliques glabrous or more or less hirtellous* with stellate and bifurcate trichomes, *narrowly lanceolate to ovate-oblong*, 6–13 mm. long, 1.5–4 mm. broad, *with obsolete to short* (up to 0.5 mm. long) and *thick style*, compressed, *flattish*, rarely twisted, *the valves definitely veiny:* seeds 18–38, oblong to rounded, 0.7–1.3 mm. long.—A highly variable circumpolar species, represented in our area by four geographic varieties:

a. Siliques narrowly to broadly lanceolate, acute or subacute, 1.5–3 mm. wide: seeds 0.7–1 mm. long.
  Cauline leaves 1 (rarely 0)–5: longer racemes mostly with 5–15 (rarely –20) siliques ..... Var. *typica.*
  Cauline leaves 5–8: longer racemes mostly with 10–35 siliques ..... Var. *orthocarpa.*

a. Siliques elliptic to oblong-ovate, obtuse, 2.5–5 mm. wide: seeds 1–1.3 mm. long.
  Cauline leaves 1–4: plant of Greenland, Baffin Land and Hudson Strait ..... Var. *brachycarpa.*
  Cauline leaves 5–14: plant of Newfoundland, southeastern Quebec and eastern New Brunswick ..... Var. *megasperma.*

Var. **typica.** *D. glabella* Pursh, Fl. Am. Sept. ii. 434 (1814); DC. Syst. ii. 355 (1821) and Prodr. i. 172 (1824); O. E. Schulz in Engler, Pflanzenr. iv[105]. 275 (1927), in part only. *D. hirta* of Authors generally, not L. (1759), acc. to Elis. Ekman, Kgl. Svenska Vet.-Akad. Handl. lvii[3]. 13 (1917) and Svensk Bot. Tidskr. xxiv. 281 (1930); Reichenb. Ic. Pl. Crit. viii. t. dcclxviii (1830); Sv. Bot. xi. t. 768, fig. 1 (1838), very characteristic; O. E. Schulz, l. c. 267, in large part, incl. fig. 29, A–J (1927). *A. daurica* DC. Syst. ii. 350 (1821) and Prodr. i. 170 (1824); O. E. Schulz, l. c. 274, at least in part (1927); Elis. Ekm. Svensk Bot. Tidskr. xxiv. 285, t. iii. figs. 1–6 (1930). *D. Henneana* Schlechtend. Linnaea, x. 100 (1836); O. E. Schulz, l. c. 276 (1927), in part, excl. at least the synonyms *D. incana*, var. *arabisans* Wats.,

D. Longii Schweinitz, *D. McCallae* Rydb. and *D. stylaris* Fern. & Knowlt. *D. dahurica* Fisch. ex Turcz. Bull. Soc. Nat. Mosc. (1838) No. 1: 87 (alteration of name). *D. magellanica* Lam., subsp. *borea* Elis. Ekm. Kungl. Svenska Vet.-Akad. Handl. lvii³: 44 (1917), in part (excl. at least the syn. *D. arabisans* Michx.). *D. hirta borea* (Elis. Ekm.) Ostenf. acc. to Ekm. in Hultén, Fl. Kamtch. ii. 161—Kungl. Svenska Vet.-Akad. Handl. ser. 3, v². 161 (1928) as synonym.—Of wide range in the Arctic and Subarctic, extending south with us to Newfoundland, Quebec, Lake Champlain, New York, and shores of Hudson Bay. The following are characteristic. LABRADOR: on



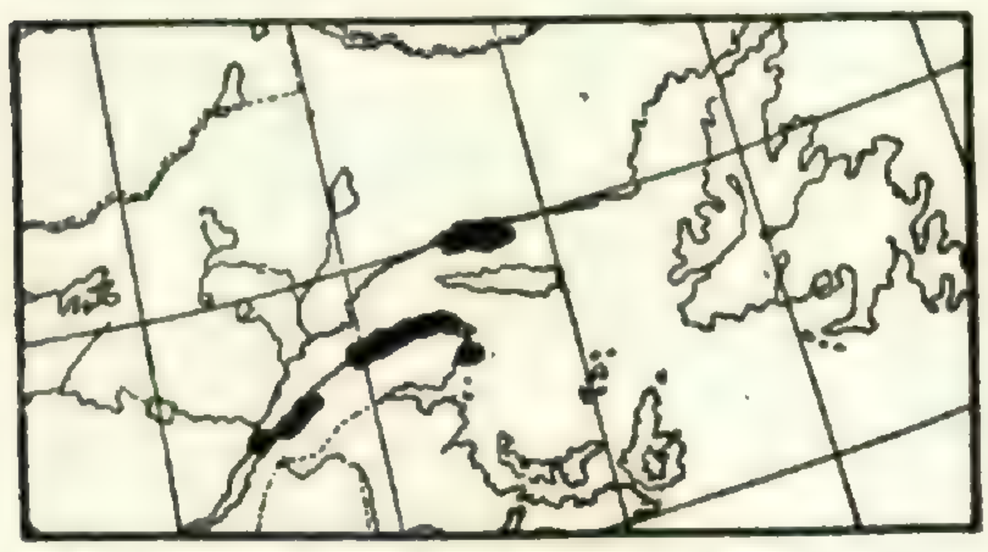
MAP 17. Range in eastern America of DRABA GLABELLA (TYPICA).

granitic rock, old sea-beaches, Northwest Bank at Head of Ryan's Bay, *Woodworth*, no. 240½; Valley of the Twin Falls, Cape Mugford Peninsula, *Abbe*, no. 371; Okkak, *Moravian Bros., Sornborger*, no. 173 in part; Port Manvers, *Gardner*, no. 317a; Anatolak, *C. S. Sewall*, no. 519; gravelly moraine, Mouth of Frazer River (near Nain), *Harlow Bishop*, no. 325; Nain, *Henne*, TYPE of *D. Henneana* Schlechtend. in Herb. Mus. Bot. Berol. (see PLATE 308, FIG. 2); Hopedale, *Gesner;* rocks at base of cliff, Dead Islands, *J. A. Allen*, no. 25; rocky hillsides, Battle Harbor, *Harlow Bishop*, no. 326. NEWFOUNDLAND: conglomerate-rock crests and crevices, shore of Dildo Run, New World Island, Notre Dame Bay, *Fernald, Wiegand & Bartram*, no. 5457; rocks, shores of Pike's Arm, *Fernald, Wiegand & Bartram*, no. 5458a; near seaward edge of Fishing Head, St. Anthony, *Abbe &*

Brooks, nos. 364, 365, 367; peaty and turfy brookside, Quirpon Island, *Fernald & Long*, no. 28,370; brookside on slaty hills back of Little Quirpon, *Fernald & Gilbert*, no. 28,365, as *D. megasperma:* slaty talus of Noddy Point, Mauve (or Noddy) Bay, *Fernald, Wiegand, Long, Gilbert & Hotchkiss*, no. 28,356; dry trap cliffs south of Ship Cove, Sacred Bay, *Fernald, Wiegand & Long*, no. 28,406, in part (mixed with *D. norvegica*); open peaty and gravelly spots on crests of trap cliffs, Cape Onion, *Fernald & Long*, no. 28,403; turfy or gravelly shelves, crests or talus of diorite, Ha-Ha Mountain, Ha-Ha Bay, *Pease & Griscom*, no. 28,379; gravelly limestone barrens near the sea, Eddy's (or Old Man's) Cove, *Fernald, Long & Fogg*, no. 1748½, transition to var. *megasperma;* dry gravelly limestone barrens, Eastern Point, St. John Bay, *Fernald, Long & Fogg*, no. 1737, transition to var. *megasperma;* limestone cliffs near Stanleyville, Bonne Bay, *Fernald, Long & Fogg*, no. 1751; high sea-cliffs, Chimney Cove, *Waghorne*, no. 19, as *Arabis hirsuta;* dry limestone barrens, local, Green Gardens, Cape St. George, *Mackenzie & Griscom*, no. 11,079. QUEBEC: limestone sea-cliffs, Île au Marteau (Eskimo I.), Mingan Islands, *St. John*, no. 90,476; sur les rochers calcaires, Île Ste.-Génévière, Mingan, *Victorin & Rolland*, no. 18,353; cailloutis calcaire du côté du large, Île Ste.-Génévière, Mingan, *Victorin & Rolland*, no. 21,471, as *D. megasperma;* sur les graviers et le cailloutis calcaires à l'embouchure, Rivière Vaureal, Anticosti, *Victorin, Rolland & Louis-Marie*, no. 21,474; cliff-shores of Gaspé Bay, Douglastown, August 22, 1904, *Collins, Fernald & Pease* (*Pease*, nos. 7350, 7353), as *D. arabisans*, var. *orthocarpa;* Les Murailles, Percé, August 17, 1904, *Collins, Fernald & Pease* (*Pease*, nos. 7357, 7358), as *D. arabisans*, var. *orthocarpa;* cold cliff, at 550 feet, Grande Coupe, Percé, August 19, 1904, *Collins, Fernald & Pease;* shaded calcareous cliffs of Little River, west of Percé, August 16, 1904, *Collins, Fernald & Pease* (*Pease*, no. 5094), as *D. arabisans*, var. *orthocarpa;* schistes nus, La Madeleine, *Rousseau*, no. 31,072; talus slope east of Rivière à Claude, *Kelsey & Jordan*, no. 65, as *D. arabisans*, var. *orthocarpa;* falaises escarpées et humides, Marsouins, *Victorin, Rolland & Jacques*, no. 33,676, as *D. arabisans*, var. *orthocarpa;* summit of talus and bases of calcareous cliffs west of Rivière aux Marsouins, *Fernald & Weatherby*, no. 2448; cliffs near Cap au Renard, *Pease*, no. 19,227; calcareous sea-cliffs and rock-slides by the Gulf of St. Lawrence, Christie, *Fernald & Pease*, no. 25,095; shaded cliffs, Cap Tourelle, August 19–21, 1905, *Collins & Fernald*, as *D. arabisans*, var. *orthocarpa;* calcareous headlands by the St. Lawrence, Grosses Roches, *Fernald & Pease*, no. 25,093; limestone and limestone-conglomerate ridges from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, nos. 1076, 1076[a]; sur le conglomérat nu, Cap aux Corbeaux, Bic, *Rousseau*, no. 26,442; près du Cap Enragé, Bic, *Victorin*, no. 9587; sur le conglomérat nu, Cap Enragé, *Rousseau*, nos. 26,503, 26,508, as *D. arabisans*, var. *orthocarpa;* mouth of Murray R., *Robt. Campbell* in Herb.

Geol. Surv. Can., no. 66,722, as *D. arabisans*, var. *orthocarpa;* Mt. St. Hilaire, Rouville Co., *Victorin*, no. 1052, as *D. arabisans*. NEW YORK: on limestone, Garden Island, Lake Champlain, near Valcour, July, 1892, *Brainerd*. UNGAVA: Ungava Bay, *L. M. Turner*, nos. 4842, 6316; Wakeham Bay, Hudson Strait, *Malte*, nos. 120,203, 120,209; "In Hudson's Bay. ⊙. *v. s.* in Herb. Banks," Pursh, l. c., TYPE of *D. glabella* at Brit. Mus. (see PLATE 308, FIG. 1); Richmond Gulf, *Spreadborough*, no. 16,272, *Low*, no. 63,144; Great Whale River, Hudson Bay, *Low*, no. 63,143. KEEWATIN: Fullerton, *J. M. Macoun*, no. 79,066, as *D. hirta*, var. *lejocarpa* Lindbl.; Chesterfield Inlet, *Gardner*, no. 377. Extending w. to Alaska. PLATES 307, 308; MAP 17.

Var. **orthocarpa** (Fern. & Knowlt.), comb. nov. *D. arabisans*, var. *orthocarpa* Fern. & Knowlt. RHODORA, vii. 66, in part only, but as to cited type, t. 60, fig. 11 (1905); O. E. Schulz, l. c. 276 (1927).—Quite like var. *typica* but more leafy, the cauline leaves 5–8, and with fuller racemes (siliques of well developed racemes 10–35).—Quebec and Keewatin. QUEBEC: rocky limestone headland, Pointe-aux-Esquimaux, Mingan, *St. John*, no. 90,485, transitional to var. *typica;* sur les corniches calcaires, Grande Île, Mingan, *Victorin & Rolland*, no. 21,469; cold rocks by permanent snow, Mt. Ste. Anne, Percé, July 24, 1905, *Williams, Collins & Fernald;* schistes, Chloridorme, *Rousseau*, no. 31,223; ledges near Pte. du Gros Mâle, *Pease*, no. 20,159; at base of calcareous slaty cliffs and talus, Cap Pleureuse, *Fernald & Weatherby*, no. 2447; dry calcareous cliffs, Cap Tourelle, *Fernald & Pease*, no. 25,094 in part (mixed with var. *typica*); calcareous cliffs, west of Méchins, *Fernald & Collins*, no. 582; low headland near the wharf (the old wharf), Bic, July 15–18, 1904, *Collins & Fernald*, TYPE of the var.; limestone and limestone-conglomerate ridges from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, no. 1212; rocher, Bic, *Rousseau*, nos. 24,831, 26,353, 26,389 and 26,548; island-headland north of Cap au Massacre, Bic, July 16, 1904, *Collins & Fernald;* rocky banks (conglomerate), Trois-Pistoles, *Victorin*, no. 30; rocks near the shore, L'Islet, *Victorin*, no. 3203; Îles Pelerins (Le Gros), Temiscouata Co., *Victorin*, no. 573. KEEWATIN: Churchill, *J. M. Macoun*, nos. 79,065, 79,068. PLATE 309; MAP 18.



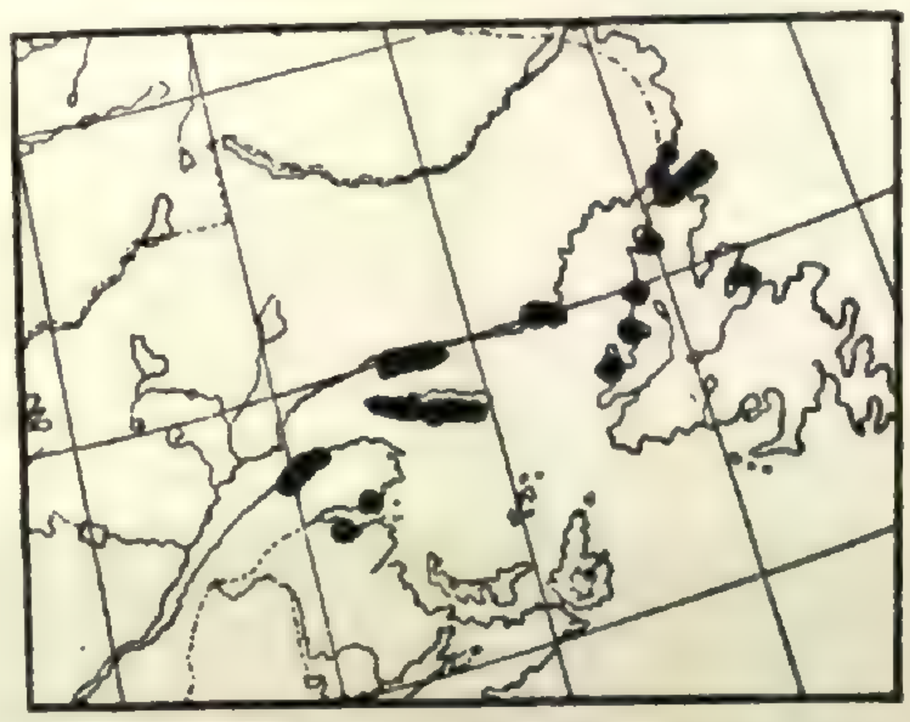
MAP 18. Range of DRABA GLABELLA, VAR. ORTHOCARPA.

Var. **brachycarpa** (Rupr.), comb. nov. *D. hirta*, var. *brachycarpa* Rupr. Fl. Samojed. Cisural. in Beitr. Pflanzenk. Russ. Reiches, Lief. 2: 22 (1845); O. E. Schulz, l. c. 271 (1927).—A marked extreme of northernmost Russia and Siberia, Greenland, Baffin Island and the

Hudson Strait region. UNGAVA: Wakeham Bay, Hudson Strait, *Malte*, nos. 118,919, 120,198, 120,243. PLATE 310; MAP 19.

MAP 19. Southeastern Extension in America of Draba GLABELLA, var. BRACHYCARPA.

Var. **megasperma** (Fern. & Knowlt.), comb. nov. *D. megasperma* Fern. & Knowlt. RHODORA, vii. 65, t. 60, figs. 6–8 (1905); O. E. Schulz, l. c. 277 (1927), excluding var. *leiocarpa* O. E. Schulz, l. c. which is a form of *D. arabisans*.—Southern Labrador, Newfoundland, eastern Quebec and northeastern New Brunswick. LABRADOR: cliffs by waterfall near shore, Forteau, *Fernald, Wiegand & Kittredge*, no. 3457. NEWFOUNDLAND: rocks, shores of Pike's Arm, *Fernald, Wiegand & Bartram*, no. 5458; damp peaty tundra, Schooner (or Brandy) Island, Pistolet Bay, *Pease & Long*, no. 28,362; damp turfy hollows in limestone barrens, Cape Norman, *Wiegand, Griscom & Hotchkiss*, no. 28,361; springy swales and turfy shores, Boat Harbor, Straits of Belle Isle, *Fernald, Wiegand & Long*, no. 28,263; turfy slope near mouth of Big Brook, Straits of Belle Isle, *Fernald & Long*, no. 28,358; dry limestone cliffs and talus, western face of Doctor Hill, *Fernald & Long*, no. 28,371, transition to var. *typica* (distrib. as *D. hirta*); conglomerate limestone and calcareous sandstone cliffs and ledges, Cow Head, *Fernald & Wiegand*, no. 3456, as *D. hirta;* shelves and talus of diorite cliffs, Western Head, Bonne Bay, *Fernald, Long & Fogg*, no. 1752, transition to var. *typica* (distrib. as *D. hirta*); banks, Rope Cove, *Waghorne*, no. 14, as *D. incana*. QUEBEC: upper slopes and crests, calcareous tableland, east of Blanc Sablon ("Labrador"), *Fernald & Wiegand*, no. 3458; rock-crests, Vieille Romaine, Archipel Ouapitagone, *St. John*, no. 90,484, as *D. arabisans*, var. *orthocarpa;* Wolf Bay, long. 60° 13′, *Abbe*, no. 1261; top of limestone shingle, Île Ste.-Généviève, Mingan, *St. John*, no. 90,475; sur les graviers calcaires, Île Ste.-Généviève, *Victorin & Rolland*, nos. 18,245, 21,476 and 24,861 (as *D. arabisans*); rivages, Île à la Chasse, Mingan, *Victorin & Rolland*, no. 24,867; sur les rochers calcaires, Île St.-Charles, Mingan, *Victorin & Rolland*, no. 18,254, 18,255; sur les corniches calcaires, Île Tête à la Baleine, Mingan, *Victorin & Rolland*, nos. 21,466, 21,472; sur les cailloutis calcaires, Île à la Vache Marine, Mingan, *Victorin & Rolland*, no. 18,257; lieux herbeux sur un îlôt



MAP 20. Range of DRABA GLABELLA, var. MEGASPERMA.

d'oiseaux, Île Nue, Mingan, *Victorin & Rolland*, no. 24,866 (very lax state); sur les déserts caillouteux du côté ouest, Île Nue, *Victorin & Rolland*, no. 24,869 (dwarfed state); prairie naturelle, Île aux Calculeaux, Mingan, *Victorin & Rolland*, no. 21,478; rivages calcaires, Île à Marteau, Mingan, *Victorin & Rolland*, no. 24,862 (as *D. arabisans*); sur les graviers calcaires, Grande Île, Mingan, *Victorin & Rolland*, no. 21,481 (transition to var. *orthocarpa*); sur les graviers du Barachois, Lac à la Croix, Anticosti, *Victorin & Rolland*, no. 27,312; sur les graviers du Barachois, Rivière Dauphine, Anticosti, *Victorin & Rolland*, no. 27,313; sur les bords d'alluvion de la Rivière Belle, Anticosti, *Victorin & Rolland*, no. 27,314; sur le Barachois, Crique de la Chaloupe, Anticosti, *Victorin & Rolland*, no. 24,865; low islands near Becsies River, Anticosti, *Victorin*, no. 3140 (as *D. arabisans*); Anse au Sanatorium, Anticosti, *Victorin*, no. 4134 (as *D. arabisans*); rocks near the sea-shore, Tourelle, July 13, 1881, *J. A. Allen;* sea-cliffs east of Ste. Anne des Monts, Tourelle, *Griscom, Mackenzie & Smith*, no. 25,770; grès denudés, Tourelle, *Rousseau*, no. 31,151; dry sandstone sea-cliffs, Capucins, *Fernald & Collins*, no. 583; limestone-conglomerate boulders in woods, Gros Crépaud, *Fernald & Collins*, no. 580; gravelly beach at Paspébiac Lighthouse, July 26, 1902, *Williams & Fernald* (TYPE of *D. megasperma*); dry gravel-beach, Paspébiac, *Collins & Fernald*, no. 91, July 27, 1902, *Churchill;* same station, *Victorin, Rolland & Jacques*, no. 33,774. NEW BRUNSWICK: dry gravel-pavement back of the beach, Belledune Point, *Fernald & Pease*, no. 25,092; near Bathurst (probably the preceding station), July, 1881, *C. Linden*. PLATES 311, 312; MAP 20.

Draba glabella is the most variable of our species, embracing not only much of the *D. hirta* of authors but many variations which have sometimes been given specific rank and scores of proposed subspecies, varieties and forms. As to the Linnean *D. hirta,* Mrs. Ekman has clearly shown that the primary type was material of the plant subsequently described as *Braya alpina* Sternb. & Hoppe.[1] Consequently, the next available name must be taken up. Mrs. Ekman at first united the boreal plant with the subantarctic *D. magellanica* Lam., but afterward withdrew it in large part and treated it, apparently correctly, as *D. daurica* DC. (1821). She made the mistake, however, of uniting with it *D. arabisans* Michx. (PLATES 314, 315), and she suspected, what, unfortunately she did not follow up, that *D. daurica* (1821) was inseparable from *D. glabella* Pursh (1814): "Die *D. glabella* müsste wohl ihrem Namen gemäss der leiocarpen

[1] This Old World species should, of course, be called BRAYA **hirta** (L.), comb. nov. *Draba hirta* L. Syst. Nat. ed. 10, ii. 1127 (1759) and Sp. Pl. ed. 2, ii. 897 (1763). *B. alpina* Sternb. & Hoppe, Denkschr. Regensb. i[1]. 66 (1815).

For detailed exposition of the typification see Elis. Ekman, Kgl. Svenska Vet. Akad.-Handl. lvii.[3] 13 (1917) and Svensk Bot. Tidskr. xxiv. 281 (1930).

Unterart, subsp. *borea* [of *D. magellanica*], entsprechen" (Ekm., Kungl. Sv. Vet.-Akad. Handl. lvii³. 49); "I have not seen the type of *D. glabella* Pursh which is derived from Arctic America, but it would not surprise me if this plant were identical with a glabrous form of *D. daurica*" (Ekm. Svensk Bot. Tidskr. xxiv. 287).

The latter surmise of Mrs. Ekman was correct. Pursh explicitly stated that his type of *Draba glabella* was in the Banks Herbarium (at the British Museum). A photograph (PLATE 308, FIG. 1) of this type, most generously supplied by Mr. J. Ramsbottom, with a detailed description of it by Mr. A. W. Exell, settles that point; and, so far as I can find, *D. glabella* Pursh is the earliest name for the variable circumpolar "*D. hirta.*" The name given by Pursh, *D. glabella*, was misleading in its connotation, so much so that practically all students, refraining from an examination of the readily accessible type, have quite misinterpreted it. Thus Hooker, who probably knew the original material and who correctly described it, made a comparison of the leafy-stemmed and comparatively large *D. glabella* with the scapose and pygmy *D. crassifolia* (PLATE 294) which threw later students off guard: "This has more the habit of *D. crassifolia* than of the following [the excessively leafy and villous *D. confusa*]; but it is three or four times the size, and has flowers as large as any in the genus."[1]

Hooker's comparison of *Draba glabella* with the really very different *D. crassifolia* was repeated by Torrey & Gray and its reiteration by others has tended further to obscure the true identity of Pursh's species. As a matter of fact, the specific name used by Pursh should be taken in the sense he presumably meant it and with appreciation of the almost microscopic character of the trichomes in his species. He enumerated three species with leafy stems: the very distinct *D. arabisans* Michx., *D. incana* L., described "D. foliis caulinis numerosis incanis, pilis implexis," and the much less obviously pubescent new species, *D. glabella* "foliis . . . glabriusculis." As compared with the villous *D. incana*, *D. glabella* has, to use Daydon-Jackson's definition, SOMEWHAT GLABROUS (*glabriusculus*) leaves. Mr. Exell's close examination of the type material, however, results in the following diagnosis: rosette-leaves stellate-pubescent; stem and cauline leaves with stellate and very short forked trichomes; pedicels mostly stellate-pubescent; siliques stellate-pubescent. In other words, in-

[1] Hook. Fl. Bor.-Am. i. 54 (1830).

stead of being essentially glabrous, the type of *D. glabella* is stellate-pubescent throughout under a lens! Had he understood *D. glabella*, Schulz would hardly have treated it as a species wholly apart from "*D. hirta*," *D. daurica*, *D. Henneana* and *D. megasperma*. In his key (his pp. 204 and 205) he places *D. hirta*, *D. daurica* and *D. glabella* under a section "*Siliculae acutae, raro acuminatae," while *D. Henneana* and *D. megasperma* are set off from them by "**Siliculae obtusiusculae vel rotundatae," although in the fuller treatment (p. 275) this key-differentiation becomes confused by the "acute"-fruited *D. glabella* being assigned "Siliculae oblongo-ellipsoideae, apice obtusiusculo." "*D. hirta*" is correctly assigned, in the key, "Caules et folia pube stellata minuta obtecta," while *D. glabella*, the type (PLATE 308, FIG. 1) of which is also stellate-pubescent throughout, is separated merely by "Caules et folia glabrescentia," a difference which would be wholly unimportant even if it were so.

As to *Draba daurica* DC., which Schulz separates from "*D. hirta*" in his key because it has "Folia caulina superiora basin versus manifeste cuneatim angustata," while "*D. hirta*" was placed under the leading division "Folia caulina superiora basin versus dilatata vel vix cuneata," it is apparent from the type of *D. daurica* (PLATE 308, FIG. 3) that Schulz could not have taken the trouble to check that important specimen at Geneva. The type, for the photograph of which I am greatly indebted to Dr. Alfred Becherer and Mr. J. F. Macbride, clearly shows the uppermost leaf "basin versus dilatata," the character ascribed by Schulz to *D. hirta*. The type thus agrees with DeCandolle's original description of *D. daurica*, "Folia . . . caulina pauca, ovata, subacuta," and not very satisfactorily with Schulz's key-character for *D. daurica:* "basin versus manifeste cuneatim angustata." Incidentally, the type of *D. daurica* has the young siliques lance-acuminate, a character not sharply brought out by the "Siliculae . . . oblongae" of Schulz's diagnosis. In his detailed diagnosis DeCandolle said "Caulis . . . pilis simplicibus basi confertioribus apice raris subpuberulus" and Mr. Macbride independently writes that the leaves have unequally forked stellate trichomes and that the leaf-margins and the stems (below densely, above very sparsely) are pubescent with long simple and once-forked weak hairs interspersed, at least below, with unequally stellate trichomes like those of the leaves. In their relative abundance on the base of the stem *D. daurica* somewhat departs from the typical

eastern American *D. glabella.* It seems, however, to be one of the variants of that species.

Draba Henneana Schlechtendal was based on a plant collected at Nain, Labrador by the Moravian missionary, Henne. It was given the very detailed and wholly accurate description which characterized the work of Schlechtendal and distinguished him as one of the really great German phytographers. In his account of the type of *D. Henneana,* Schlechtendal described the young fruits: "siliculis pedicello suo longioribus anguste ellipticis brevissimo stylo apiculatis et ut omnes reliquae partes plantae pilis stellatis simplicibusque obsessis." The type specimen of *D. Henneana* (PLATE 308, FIG. 2), now unfortunately much broken, has most liberally been sent to me from Berlin by Dr. Milbraed. So far as I can see it is inseparable from the pubescent-fruited individuals of "*D. hirta,*" from the common run of Labradorean *D. glabella* (the type of which is also stellate throughout) and from *D. daurica.* Although the type of the latter has quite glabrous ovaries, while those of the types of *D. glabella* and of *D. Henneana* are pubescent, this character alone is so very fickle in the species that I am inclined to ignore it. The siliques throughout the series of North American varieties range from quite glabrous, through an intermediate series with scabrous or hirtellous surfaces, to a few which are more positively stellate-hirsute. There seems to be no geographic nor taxonomic significance to the character in this particular species.

For some reason, which I am wholly at a loss to explain, Schulz segregates from his true *Draba Henneana* (originally described by Schlechtendal "siliculis . . . pilis stellatis simplicibusque obsessis") the individuals with pubescent siliques as a separate

Var. **McCallae** (Rydberg) O. E. Schulz [spelled by Schulz Mac Callae]—*D. McCallae* Rydberg in Bull. Torrey Bot. Club XXIX. (1902) 241. *D. stylaris* Fernald and Knowlton in Rhodora VII. 76. (1905) 64, pro parte, non Gay.—Siliculae pilis brevibus simplicibus bifurcis intermixtis obsitae.

As conceived by Schulz, therefore, his var. *McCallae* differs from true *D. Henneana,* accurately described by Schlechtendal "siliculis . . . pilis stellatis simplicibusque obsessis," by having the almost identical character: "Siliculae pilis brevibus simplicibus bifurcis intermixtis obsitae." Further to elucidate his understanding of the matter, Schulz, under his glabrous-fruited *D. Henneana* cited the single type specimen as belonging to both!: "Nain (Missinar H e n n e, auch var. *Mac Callae*)"! Although the description and at least the

Labrador specimens cited by Schulz as showing his conception of his *Draba Henneana*, var. *McCallae* belong to typical *D. Henneana*, therefore to *D. "hirta,"* to *D. daurica* and to *D. glabella*, they have no close relationship to *D. McCallae* Rydb. The latter species is a very clear-cut plant of the northern Rocky Mountains. The type of it (PLATE 313, FIGS. 1 and 5), which Dr. Gleason has most kindly allowed me to have photographed, has very softly pilose stems, with few if any of the sessile or subsessile stellate trichomes which so closely cover the surface in *D. glabella* (including *Henneana*); instead, the lower internodes (PLATE 313, FIG. 4) are copiously pilose to villous with long and soft spreading or retrorse simple hairs. The leaves (FIG. 3), too, have a sparser but longer and mostly simpler (or merely bifurcate) pubescence than in *D. glabella*. The flowering raceme is promptly, instead of tardily, elongate, and in full maturity (as shown by ripe fruiting plants, FIG. 2) it is ⅔ the full length of the stem (much as in *D. aurea*), with very slender and elongate pedicels. The siliques (FIG. 6), both in the type and in ripe material of *D. McCallae*, are oblique or semilunate and covered with more spreading pubescence than in *D. glabella*. *D. McCallae*, in the abundant spreading and mostly simple pubescence of the siliques and in its elongating flowering raceme, is very near the Asiatic *D. dasycarpa* C. A. Meyer, so beautifully shown in Lœdeb. Icon. Pl. Fl. Ross. iii. t. 264 (1831). Its identification with *D. Henneana*, the type of which is "also var. *MacCallae* (auch var. *MacCallae*)" could have resulted only from complete misunderstanding of it.

As to the citation under Schulz's var. *McCallae* of "*D. stylaris* Fernald and Knowlton . . . pro parte," this was apparently due to the inclusion, erroneously, by Knowlton and myself of the synonym *D. Henneana*, about which we then knew nothing but the description, under *D. stylaris*. One or two other synonyms of *D. Henneana* given by Schulz demand a word of clarification. Under his typical *D. Henneana* he includes in the synonymy *D. arabisans* Michx., β. Torr. & Gray, Fl. N. Am. i. 106 (1838) and *D. Longii* Schwein. ex Torr. & Gr. l. c. as syn. Without entering now into specifications, it should be noted that the original sheet in the Torrey Herbarium of *D. arabisans*, β. T. & G. (based on the manuscript *D. Longii*) bears very detailed notes by Torrey and is a characteristic Great Lake form of *D. arabisans*, just as Torrey & Gray correctly decided. It does not belong to *D. glabella* (including *D. Henneana*).

As to numerous other synonyms placed by various authors under *Draba "hirta," D. glabella, D. daurica* and *D. Henneana,* I am not situated to judge correctly of their status. The unwisdon of guessing at the identities of Drabas (or any other plants) by descriptions alone should be evident. The failure to recognize this elementary principle of sound taxonomic and nomenclatural study has been sufficiently emphasized in the preceding discussion. Without knowing from actual study of the types or of undoubted authentic specimens, I must pass by varietal names which, ultimately, may have to replace some which I am here using. With the exception of one (var. *brachycarpa*), the names used under *D. glabella* have been verified by examination of the taxonomic and nomenclatural types.

As already stated, the occurrence of slight pubescence on or its absence from the siliques in the wide-ranging *D. glabella* does not seem to me sufficiently constant to be used in breaking the species into its geographic varieties. The four marked trends which I have recognized in eastern America pass more or less into one another but they have their own primary centers of distribution and seem to be fairly definite geographic varieties. Var. *typica* (PLATES 307, 308), with few cauline leaves, acute or acutish, lanceolate siliques and relatively small seeds, is generally dispersed around the North and extends southward into the area of two of the varieties.

In the region of the Lower St. Lawrence and the Gulf and to some extent in the Hudson Bay area there occurs a more leafy extreme (cauline leaves up to 8) which, when well developed, has more numerous flowers and fruits than the more boreal type. This is var. *orthocarpa* (PLATE 309). When it was first published as *D. arabisans,* var. *orthocarpa* Fern. & Knowlt. our understanding of *Draba* was most rudimentary. Some of the cited specimens belong to *D. arabisans* as I now conceive it, others were very typical *D. glabella* and a few, including the TYPE-specimen (PLATE 309), were of the leafier variation of *D. glabella.* It becomes necessary, therefore, to recast the very confused conception which was originally expressed by *D. arabisans,* var. *orthocarpa.*

Var. *brachycarpa* (PLATE 310) barely reaches our area. The eastern American material I have seen is abundant specimens from Greenland, a few from Baffin Island and one collection from northern Ungava. I have seen no authentic material identified by Ruprecht, but his description was so good that I have followed Schulz in placing in var. *brachycarpa* the broad-fruited Greenland plants.

Var. *megasperma* (PLATES 311, 312), although originally put out as a species and so maintained by Schulz, clearly passes into var. *orthocarpa* and in fruit alone is scarcely separable from the more boreal var. *brachycarpa*. It differs from the latter in its greater size and more numerous leaves and is, doubtless, a Newfoundland and Gulf of St. Lawrence representative of the Greenland plant. Closely simulating var. *megasperma* but even more leafy is the newly proposed *D. laurentiana* (PLATES 304, 305). This plant, localized in much the same area as var. *megasperma*, differs from it, not only in its greater leafiness but in the abundant simple spreading pubescence of the lower internodes. Eventually it may seem right to treat it as another extreme variety of *D. glabella*. If, however, we abandon the character of pubescence in the classification of *Draba*, the whole structure must collapse. This dependence on the character of the trichomes is one of the least insecure reliances in the group; and, for the present, I am hopefully clinging to it!

One more name must be noted. This is *Draba megasperma*, var. *leiocarpa* O. E. Schulz, l. c. 277, based on *Collins & Fernald*, no. 93, from Bic, Quebec (PLATE 315, FIGS. 1 and 5). This material was originally included in the mixed *D. arabisans*, var. *orthocarpa*, but it differs from the cited type (PLATE 309) in actually having all the significant characters of *D. arabisans* with plane siliques: the long pedicels, long style and the smooth (not veiny) surfaces of the very thin and acute siliques. It does not belong with *D. megasperma* (PLATES 311, 312), which has the obtuse siliques much broader, on shorter and thicker pedicels and with nearly obsolete style, the less flattened siliques with veiny or rugose surfaces.

(*To be continued*)

NOTES ON THE FLORA OF TENNESSEE: DIOSCOREA

W. A. ANDERSON

FROM the time of publication of Gray's Manual, first edition, until the appearance of Bartlett's revision[1] of *Dioscorea* in 1910 all the native yams of the eastern United States were grouped under one species, *D. villosa* L. Bartlett recognized five species of which three

[1] Bartlett, H. H., The Source of the Drug Dioscorea, with a Consideration of the Dioscoreaceae found in the United States. Bureau of Plant Industry, Bull. no. 189 (1910).

are of interest in a study of the Tennessee flora. The other two, which he described as new, are restricted to the southeastern coastal States.

Bartlett quite properly separated the widely dispersed northern species from the Alleghanian species. Unfortunately, however, he rejected the name *D. villosa* and applied *D. paniculata* to the northern species, while he recognized two species in the Appalachian region where there is probably only one. These two are described as alike in having verticillate leaves and in having much larger fruits than the widespread northern plant. According to Bartlett there is a form restricted to the mountains which has coarse, knotted, much-branched, rootstocks and leaves which are glaucous beneath, while a more southern lowland form differs from it in having relatively unbranched rootstocks and green leaves. The former he identifies with *D. glauca* of Muhlenberg's Catalogue and the latter with *D. quaternata* (Walt.) Gmel. The distribution-map which accompanies the description of the latter species shows it to be a plant, not of the lowlands, but of the foothills, which belong to the Alleghanian floral region. Study of specimens from all parts of this region fail to show any great differences in leaf surface. The writer has not had opportunity to examine many rootstocks, but the fruits and seeds were alike in all specimens which had them. It seems better to adopt the conservative treatment of all these Alleghanian plants as one species, the name of which is *D. quaternata*.

Walter[1] described two species with verticillate leaves, *Anonymos* (Dioscoreae affinis ?) *quaternat.*, and *Anonymos* (Dioscoreae affinis ?) *quinat.* The latter has frequently been cited as a synonym of *D. villosa.* It is probably the same as *D. quaternata* which usually has more than four leaves in a whorl.

Blake has shown that the Linnean species *D. villosa* need not be rejected, as there is a specimen in the Clayton herbarium which fixes its identity.[2]

The two well-marked species of *Dioscorea* which appear in our manuals under *D. villosa* may be separated as follows:

DIOSCOREA QUATERNATA (Walt.) Gmel. Syst. 581 (1796). *Anonymos quaternat.* Walt. Fl. Car. 246 (1788). *D. glauca* Muhl. Cat. 92 (1813) as defined by Bartlett l. c. 13 (1910). *D. villosa*, var. *glabra* C. G. Lloyd, in King & Lloyd, Suppl. Am. Dispens. 81 (1880). Rootstock thick and much branched; stem twining, glabrous; lower leaves

[1] Walter, Flor. Carolin., 246 (1788).

[2] Blake, S. F., Notes on the Clayton Herbarium, RHODORA XX. 48 (1918).

verticillate, the upper in pairs or alternate, blades of the larger ones often 10 cm. long, petiole often villous at the junction with the blade, blade more or less puberulent beneath, or glabrous, glaucous on lower surface, usually repand; inflorescences one in the axil of each leaf; ripe capsules 20–30 mm. long; seeds, exclusive of wing, 5–6.5 mm. broad.—Pennsylvania to western Florida, Missouri, Arkansas and Oklahoma. It has been found in all parts of Tennessee. The following is a representative, but not a complete list of stations. Woods, rocky ridge, Cades Cove, June 15, 1928, *Anderson & Jennison;* White Cliff Springs, Monroe County, June 29, 1890, *Scribner;* along Clinch River between Tate and Tazewell, May 12, 1929, *Hesler & Jennison;* Knoxville, *Scribner*, no. 7345; ledges, Lookout Mountain, Chattanooga, May 22, 1911, *Churchill;* sandy woods along creek, Daysville, *Jennison, Hesler & Anderson*, no. 1408; Cowan, July 14, 1867, *Gattinger;* Kingston Springs, *Svenson*, no. 280; Haywood County, June 6, 1893, *Bain.*

Dioscorea villosa L. Sp. Pl. ii. 1033 (1753). *D. paniculata* Michx. Fl. Bor.-Am. ii. 239 (1803). Rootstock little branched (Bartlett); stem twining; none of the leaves verticillate, blades rarely more than 8 cm. long, densely pubescent on lower surface, petiole glabrous; inflorescence a small panicle or raceme, one in the axil of each leaf; ripe capsule 15–20 mm. long; seeds, exclusive of wing, 3–4.5 (usually 4) mm. broad.—Connecticut to New Jersey, west to Minnesota and Oklahoma.

Var. *glabrifolia* (Bartlett) Stone, Pl. So. N. J. 358 (1912) (*D. paniculata*, var. *glabrifolia* Bartlett, l. c. 15 (1910)), has glabrous leaves, otherwise as in the species. One specimen from Haywood County, Tennessee, *Bain*, no. 321, is cited by Bartlett. This specimen has no capsules or lower leaves by which it can be positively identified. It bears the same data as a specimen of *D. quaternata* from the same region, and the same number as one of *D. quaternata* collected the year before. It is probable that this is a fragmentary duplicate of one of these specimens, and that *D. villosa* has not been collected in Tennessee.

The State University of Iowa
Iowa City, Iowa

SOME INADEQUATELY CHARACTERIZED SPECIES OF GEORGE VASEY

M. L. Fernald and C. A. Weatherby

In 1907, the late Theodor Holm clearly described a new grass as *Glyceria paupercula* Holm in Fedde, Repert. iii. 337 (1907), stating, correctly, that "It is a member of the section *Atropis* Rupr." A definite type was cited and afterward an exquisite heliotype plate

of it with the diagnostic details was published: Geol. Surv. Can. Pl. x. Everything essential to ideal diagnosis and publication of a new species was there, except the actual date of issue of the plate, a matter beyond the control of its author.[1] Consequently, viewing *Glyceria* § *Atropis* as constituting a genus, *Puccinellia,* we transferred Holm's species to it, making the combination *Puccinellia paupercula* (Holm) Fernald & Weatherby, RHODORA, xviii. 18 (1916). Typical *P. paupercula* is essentially eastern, but a larger and wide-spread variety, var. *alaskana* (Scribn. & Merr.) Fern. & Weath., l. c., based on *P. alaskana* Scribn. & Merr. Contr. U. S. Nat. Herb. xiii. 78 (1910), abounds on Vancouver Island.

It now seems that in 1888 George Vasey got hold of something of the sort. In a running account of a number of new grasses he wrote[2] without any paragraphing of the separate entities, without any differentiation of them as new, and for the most part without any statement of really diagnostic characters, a rambling summary of them, thus:

> A considerable number of other new or interesting forms have been received . . . and I wish here briefly to give a short account of them. Mr. J. Macoun botanized in Vancouver Island the past season . . . he sends the following: *Deyeuxia Vancouverensis*, a small species, 10 or 12 inches high, with spicate panicle 1½ to 2 inches long, approaching *D. strigosa*, Kth.; . . . *Deschampsia caespitosa*, variety *maritima*, 6 to 8 inches high, growing on the seashore; . . . *Glyceria pumila*, about 4 inches high, panicle small, mostly of three to five approximate sessile spikelets with a lower branch ½ to 1 inch long; *Bromus Macounii*, closely resembling *B. erectus*, Huds., but with a smaller, purplish panicle. . . . .
>
> Mr. G. C. Nealley . . . has discovered several new species, among which are *Triodia Nealleyi*, of similar aspect to *T. avenacea*, and another *Triodia* of which, unfortunately, too little for full characterization was collected and which may be called *T. repens;* . . . *Sporobolus Nealleyi*, a dwarf, erect species, with small, open panicle; etc., etc.

Naturally, such names are published *as names* but they are not accompanied by any characters which are *specifically* diagnostic; at best the brief and inconsequential phrases accompanying them merely describe habit and not the details of glumes, lemma, palea, ligule or other parts which Dr. Vasey knew to be fundamental in separating species of grasses. It is most likely that he was merely publishing what nowadays would be called a preliminary announcement, intending later to give proper diagnoses; as some of his other

[1] For data regarding this series of plates see RHODORA, xxx. 151 (1928).
[2] Bull. Torr. Bot. Cl. xv. 48, 49 (1888).

work shows he regularly prepared diagnoses in his more serious papers. Such entities as Vasey had, if they can be found, for he cited no actual types or specimens, may be identifiable; but it seems to us a very doubtful and needlessly disturbing policy to take up their names to displace those of species which had been carefully characterized and accurately illustrated. Nevertheless, we now have an effort made to displace the beautifully definite *Puccinellia paupercula* by the woefully indefinite *P. pumila* (Vasey) Hitchc. Am. Journ. Bot. xxi. 129 (1934). Vasey's original description of the habit, "about 4 inches high, panicle small," etc. has already been fully quoted. There are many species which may be "about 4 inches high" and with "panicle small." Vasey gave not a single word about the size of the anther and the grain nor the characters of glume, lemma and palea, all of which are highly important in *Puccinellia.* Furthermore, he did not even give a clue and presumably did not know that it was a *Puccinellia;* to him it was simply another *Glyceria.* Taxonomy has reached a low ebb when such inadequately defined names can be taken up to displace those which had perfect definition. Quite aside from the unimportant question of the authorship of *Puccinellia paupercula,* we feel that the important cause of sound and convincing nomenclature would be seriously set back by accepting such names of Vasey (and others) as those above noted. At best they are *nomina subnuda.*

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NOTES FROM THE HERBARIUM OF THE UNIVERSITY OF WISCONSIN—XI[1]

Norman C. Fassett

Extensions of Ranges of Aquatic Plants. In recent years the activities of collectors of aquatic plants in Wisconsin have resulted in several extensions of known ranges. The three men who have contributed most in this field have been Mr. John H. Steenis, working with the Wisconsin Land Economic Survey, Mr. L. R. Wilson, collecting in conjunction with his studies at the Trout Lake laboratories of the Geological and Natural History Survey, and Mr. Neil Hotchkiss of the U. S. Biological Survey. One of the most remarkable finds was that of *Potamogeton confervoides* in Langlade County, extending its known range westward from eastern New York and Pennsylvania.[2] This pondweed was collected by Wilson and Steenis in Greater Bass Lake, near Summit Lake P. O. The lake lies in drift of the Fourth Wisconsin glaciation. Identification of this species has been confirmed by Professor Fernald. Another eastern pondweed found near Summit Lake was *P. Oakesianus*, which was collected in Greater Bass Lake and in the nearby First Lake, and whose range is given is Gray's Manual as "Anticosti to n. N. Y. and N. J." This was also collected by Steenis in the northwest corner of Juneau County, in the bed of Glacial Lake Wisconsin. In the same lake bed is Wisconsin Rapids, where the plant was collected in 1894 by L. S. Cheney. Mr. Cheney also collected it at Stevens Point, just north of the limits of this now extinct lake. *Najas gracillima* has until recently been un-

[1] Published with aid to Rhodora from the National Academy of Sciences.

[2] See Fernald, Mem. Am. Acad. of Arts & Sci. xvii. pt. 1: 33 (1932).

known west of eastern New York;[1] it was collected by Hotchkiss and by Steenis in 1931 in Little Sissabagama Lake, near Stone Lake P. O., Sawyer County. The following summer it was collected by the writer in a small muddy pool west of Wisconsin Dells (formerly Kilbourn); this pool lies in an ancient abandoned channel of the Wisconsin River. Later in the same season it was again found by Mr. Hotchkiss and the writer, this time in the terminal moraine east of Wisconsin Dells, in Kittleson Pond, once close to the waters of Glacial Lake Wisconsin. *Littorella americana* enjoys a reputation for great rarity. It comes as something of a surprise, then, to find that it is a characteristic and abundant plant in many lakes of northern Wisconsin. Due to the efforts of the collectors named above, we now know it from the following Lakes. Sawyer County: Ham Lake, Round Lake, Ashegan Lake, all near Hayward. Douglas County: Round Lake near Gordon. Vilas County: Crystal Lake, Muskellunge Lake, Little John Jr. Lake, all near Trout Lake P. O., Langlade County: Town Line Lake, Summit Lake, Lower Clear Lake, Long Lake, Lower Bass Lake, all near Summit Lake P. O. Shawano County: Shawano Lake.[2] With one exception, only submerged and sterile plants were found. Those at Muskellunge Lake were exposed by lowering of the water-level, and were flowering. It may be that the apparent rarity of *Littorella* is due simply to the infrequency of its flowering, and to the fact that sterile individuals, in deep water, are easily overlooked. They are ordinarily to be found only by dredging, which was the method used by Steenis and by Wilson.

Upper Holly Lake. This little lake, 12 miles south of Hayward, Sawyer County, was found by Mr. Steenis to be one of the most interesting in the state. The water is very soft (pH 6.5), but while the flora of most soft-water lakes in the region consists of such small and rigid plants as *Elatine, Eriocaulon, Isoetes, Lobelia Dortmanna* and the like, with larger plants absent or rare, Upper Holly Lake has an abundant growth of *Elodea, Potamogeton, Nymphozanthus*, etc. It is the only very soft-water lake in the region in which muskellunge are found.[3] There are four species of *Utricularia: U. vulgaris*, common in medium- to hard-water lakes in the region but usually not in soft water; *U. gibba* and *U. minor*, both very rare in Wisconsin; and *U.*

[1] Fernald, Rhodora xxv. 109 (1923).

[2] Mr. Steenis tells of bathing in Shawano Lake and finding the leaves of *Littorella* stiff and sharp and abundant enough to cause discomfort.

[3] Data concerning Upper Holly Lake from Steenis, in Land Economic Inventory of northern Wisconsin: Sawyer County, p. 63 and table XIII (1932).

purpurea, unknown elsewhere in the state. *Potamogeton pulcher*, whose range Gray's Manual gives as "s. Me. to Fla.; and near St. Louis, Mo.," was collected in Upper Holly Lake. It is also represented in the Gray Herbarium, collected at Taylor's Falls, Minnesota, by F. P. Metcalf. *Eleocharis Robbinsii*, recorded in Gray's Manual as occurring "w. to Mich. and Ind.," is abundant on the shores of Upper Holly Lake, and has also been recently collected by Mr. Hotchkiss in Burnett, Polk, Barron and Oconto Counties.

ELATINE TRIANDRA IN WISCONSIN. This occurrence was recently reported by the writer,[1] and related to a now extinct glacial lake. Since this report it has again been collected by Mr. Neil Hotchkiss and the writer in Kittleson Pond, 5 miles east of Wisconsin Dells, which, like the pond in which the earlier collection was made, borders on glacial Lake Wisconsin. A collection from Round Lake, 5 miles east of St. Croix Falls, Wisconsin, September 5, 1927, *Fassett & Wilson*, no. 15290, proves also to be this species. This is of special interest because Round Lake bears much the same relation to glacial Barrens Lake[2] that the two neighboring lakes in southern Wisconsin bear to glacial Lake Wisconsin. The three lakes where the *Elatine* has been found are all kettleholes in terminal moraines, and are all so small that each is little more than a large mud-puddle.

The habitat of *E. triandra* seems to be quite different from that of the commoner *E. minima*. The latter species, in the Middle West at least, is always on sandy shores or in shallow water with sandy bottom. *E. triandra*, at its three known stations in Wisconsin, is on muddy shores or in shallow water underlain by soft mud. At its only known station in New England, at Coburn Park, Skowhegan, Maine, which was visited by the writer in 1931, it is also in shallow water and is rooting in a muddy bottom. Since the banks of the pool are overhanging and grassy, so that there is no opportunity for the *Elatine* to grow on the shore, the only form occurring there is the submerged f. *callitrichoides*. Incidentally, an inspection of this locality is sufficient to convince the writer of the correctness of the suggestion[3] that *E. triandra* is not native at that place.

SILENE CSEREII IN THE MIDDLE WEST. For some time the writer was puzzled by the presence in the herbarium of two quite different plants, each of which could with Gray's Manual be identified as

[1] Trans. Wis. Acad. xxv. 200 (1930).
[2] See McLaughlin, Ecological Monographs ii. 357 (1932).
[3] Fernald, RHODORA xix. 12 (1917).

Silene latifolia. Upon their being taken to the Gray Herbarium, the two species were at once recognized by Mr. Weatherby as *S. latifolia* and *S. Csereii*,[1] respectively. The latter is a native of the Balkan Peninsula and Asia Minor. A study of American material shows the following distinctions:

S. LATIFOLIA: calyx campanulate, at maturity only slightly narrowed at summit, rounded at base or in age depressed about the pedicel, the nerves mostly weak, much branched and freely anastomosing; upper bracts of the inflorescence scarious and glabrous throughout.

S. CSEREII: calyx ovoid, strongly narrowed at summit, tapering at base, the nerves very little if at all branched; upper bracts of the inflorescence firm and ciliate.

S. Csereii is represented in the Herbarium of the University of Wisconsin as follows: MINNESOTA: Pigeon River, Cook Co., August, 1927, *M. R. Shaw*, no. 470. WISCONSIN: Amnicon Lake, Douglas Co., July, 1927, *Shaw*, no. 483; Centuria, July 19, 1924, *J. J. Davis;* Fountain City, July 7, 1922, *H. H. Smith*, no. 7078; Camp Douglas, July 1, 1926, *Davis;* railroad tracks, Lyndon Station, June 30, 1917, *Davis;* Portage, August 10, 1926, *Davis*. INDIANA: on ballast, Gary, June 29, 1909, *L. M. Umbach*, no. 3685. Also recently reported from Linden, Indiana.[2] It is represented in the Gray Herbarium as follows: MONTANA: near Westby, July 7, 1927, *Esther L. Larsen*, no. 74. IOWA: dry gravelly ground, Estherville, September 22, 1925, *B. O. Wolden;* in dry gravelly ground along railroad right-of-way, Estherville, June 15, 1926, *Wolden*, no. 1219. OHIO: ballast, Erie R. R. dump, Phalanx, July 6, 1924, *Almon B. Rood;* pier track, Sandusky, August 14, 1920, *E. L. Moseley*.

MADISON, WISCONSIN.

EPIFAGUS VIRGINIANA IN MISSOURI.—The absence of Beech-drops in Missouri has long been a puzzle. Beech trees (mostly *Fagus grandifolia* var. *caroliniana*) occur in Missouri only in the southeastern portion of the state, chiefly on Crowley's Ridge, the only area of topographic relief in the lowlands. Over some portions of Crowley's Ridge in southeastern Missouri and on adjacent hills in the Ozark region bordering the southeastern lowland area, as in Perry and Cape Girardeau counties, there are some good stands of beech groves. It would be expected that, as in other areas east and north of Missouri, the beech-drops (*Epifagus virginiana*) could be found in any fair-sized grove of beech trees. However, there have been many attempts

[1] Baumg. Enum. Stirp. Transs. iii. 345 (1816); Williams, Journ. Linn. Soc. xxxii. 49 (1896); Ascherson & Graebner, Syn. Mitt.-Eur. Flora v. pt. 2: 62 (1929).

[2] Deam, Proc. Ind. Acad. Sci. xlii. 48 (1933).

in the past to locate *Epifagus* under beech groves in Missouri, and each has been fruitless. The writer several times searched diligently in late autumn in beech groves in southeastern Missouri without locating the elusive beech-drops, and hope for discovering it in the state had been almost forsaken.

During the month of October, 1933, Mr. J. H. Kellogg was collecting on Crowley Ridge in Scott Co., and in a fair-sized stand of *Fagus grandifolia* var. *caroliniana* found *Epifagus virginiana* in plentiful numbers. A number of eastern and southeastern species are known in Missouri only from the Crowley Ridge and adjacent hill section of southeastern Missouri, and the discovery of *Epifagus virginiana* adds still another eastern species to the list.—JULIAN A. STEYERMARK, Missouri Botanical Garden, St. Louis, Mo.

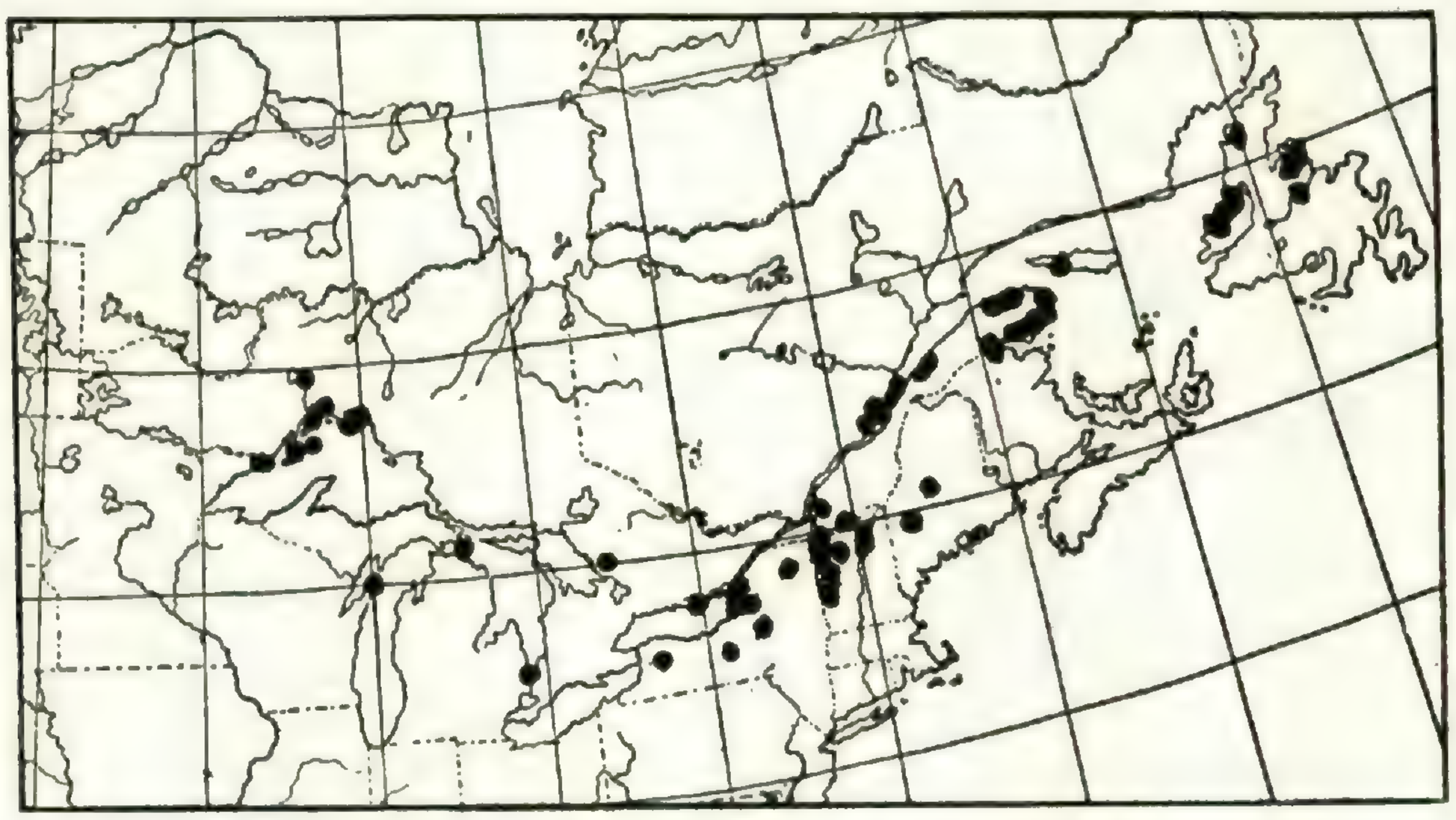
DRABA IN TEMPERATE NORTHEASTERN AMERICA

M. L. FERNALD

(*Continued from page 344*)

17. D. ARABISANS Michx. More or less cespitose *perennial*, forming simple or freely forking mats 0.2–2.5 dm. across, the drab or pale-brown mostly forking caudices retaining fibrous shreds of dead leaves, ending in depressed rosettes 1.5–14 cm. across: *rosette-leaves* oblanceolate or spatulate, entire or somewhat dentate, attenuate to a petiolar base, 0.7–7 cm. long, 0.2–1.6 cm. broad, *thin, closely and minutely* (in shade more sparsely and less minutely) *stellate-pannose*, in age sometimes glabrate: *flowering stems* 1–40, slender, simple to freely branching, *with* often *flexuous* loosely ascending *branches*, 0.5–4.5 dm. high, glabrous or sparingly to closely *stellate-tomentulose*, rarely with a few spreading and simple trichomes, often glabrate at summit; *cauline leaves* 3–12, oblanceolate, oblong or narrowly obovate, *cuneate to but slightly rounded at base*, serrate-dentate to entire, 0.5–4.5 cm. long, 0.2–1 cm. broad, stellate-pubescent to glabrous: *racemes* corymbiform in flower, *elongating in fruit and rather lax;* the *primary ones* 7–25-flowered, *in fruit* becoming 2–12 cm. long and 1.3–3 *cm. in diameter: pedicels slender*, glabrous or sparsely stellate-pilose, *divergent or arched-ascending, the lowest* 3–15 (rarely –25) *mm. long:* sepals oblong, obtuse, 1.8–3 mm. long, 1–1.5 mm. broad, glabrous or sparsely hirtellous, white-margined: petals white, broadly obovate, emarginate, unguiculate, 4.5–6 mm. long, 2.8–3.8 mm. broad: anthers 0.5 mm. long: *ovary glabrous, with a distinct slender style: siliques very thin*, strongly compressed, *glabrous*, narrowly lanceolate to narrowly elliptic or ovate, *commonly acuminate*, usually twisted but sometimes

plane, 5–15 mm. long, 1.5–3 mm. broad, *with slender style* 0.5–1 *mm. long; the valves smooth and veinless*, often lustrous: seeds 12–36, oblong or rounded, 1.1–1.7 mm. long.—Fl. Bor.-Am. ii. 28 (1803); DC. Syst. ii. 349 (1821); Torr. & Gray, Fl. N. Am. i. 106 (1838), in large part; Gray, Gen. i. 160, t. 68 (1848); Fern. & Knowlt. Rhodora, vii. 65, t. 60, fig. 9 (1905); O. E. Schulz, l. c. 275 (1927). *D. Arabis* Pers. Syn. ii. 190 (1807). *D. incana*, var. *glabriuscula* Gray, Ann. Lyc. Nat. Hist. N. Y. iii. 223 (1835). *D. Longii* Schwein. ex Torr. & Gray, l. c. (1838) as synonym. *D. incana*, var. *arabisans* (Michx.) Wats. Proc. Am. Acad. xxiii. 260 (1888). *D. arabisans*, var. *orthocarpa* Fern. & Knowlt. l. c. 66 (1905), in part only and excluding the cited type.—Cliffs and exposed ledges of argillaceous, basic or calcareous



Map 21. Range of Draba arabisans.

rock, Newfoundland to the Lake Superior region of Ontario, south, rather locally, to New Brunswick, Maine, Vermont, New York, Michigan, Wisconsin and Minnesota.—Newfoundland: dry cliffs and talus, Tilt Cove, *Fernald, Wiegand & Darlington*, no. 5463; dry rocks, Snook's Arm, *Fernald, Wiegand & Darlington*, no. 2462; ledges and talus, north bank of Exploits R., Grand Falls, no. 5461; calcareous cliffs, ledges and talus, Bard Harbor Hill, *Fernald & Long*, no. 28,367, *Wiegand, Gilbert & Hotchkiss*, no. 28,368; dryish limestone talus, Doctor Hill, *Fernald & Long*, no. 28,366; limestone near crest (alt. 650 m.), Killdevil, Bonne Bay, *Fernald, Long & Fogg*, nos. 1739, 1740; limestone ledges and talus, Shag Cliff, Bonne Bay, *Fernald, Long & Fogg*, no. 1738; dry limestone shingle and talus, Penguin Head, Bay of Islands, *Fernald, Long & Fogg*, no. 1736; dry limestone talus, Druid's (or Raglan) Head, Bay of Islands, *Fernald, Long & Fogg*, no. 1735; slaty cliffs, McIver's Cove, Bay of Islands, *Fernald, Long & Fogg*, no. 1732; sea-cliffs, John's Beach, Bay of

Islands, *Waghorne*, no. 22; cliffs along shore, near Frenchman's Cove, Bay of Islands, *Mackenzie & Griscom*, nos. 10,268, 10,289; talus slopes of marble region between Mt. Musgrave and Humbermouth, *Fernald, Wiegand & Kittredge*, no. 3459; dry limestone ledges and shingle, Hannah's Head, lower Humber Valley, *Fernald, Long & Fogg*, no. 1733. QUEBEC: on shingle, West Point, Anticosti, *J. Macoun* no. 20; dry (inland) calcareous cliffs near Cape Gaspé, *Pease*, no. 20,205; rochers calcaires de la Montagne St.-Alban, vers 300 m. d'alt., *Victorin, Rolland, Brunel & Rousseau*, nos. 17,382, 17,383; talus of calcareous cliffs near Cape Rosier, *Pease*, no. 20,208; calcareous cliffs, Mt. Ste. Anne, Percé, August 18, 1904, *Collins, Fernald & Pease* (*Pease*, nos. 7355, 7356), *Fernald & Collins*, no. 1070, *Victorin, Rolland, Brunel & Rousseau*, no. 17,378, *Pease*, no. 20,241; rocky slope, Round Rock, Grand River, Gaspé Co., June, 1903, *G. H. Richards*, June 30–July 3, 1904, *Fernald;* dry slaty talus of cliffs east of the head of Lac Pleureuse, *Fernald, Dodge & Smith*, no. 25,772; sur les cailloutis calcaires près du Lac Pleureuse, *Victorin, Rolland & Jacques*, no. 33,437; calcareous cliffs and rock-slides by the Gulf of St. Lawrence, Christie, *Fernald & Pease*, no. 25,090, 25,091; trap cliffs at 1800–1900 feet, Tracadigash Mt., Carleton, July 24, 1904, *Collins, Fernald & Pease* (some fruits with 3 carpels); calcareous ledges and cliffs, Bic, many collections, July 16 and 18, 1904, *Collins & Fernald*, July 17, 1904, *Collins & Fernald, Fernald & Collins*, nos. 92, 93 (cotype of *D. megasperma*, var. *leiocarpa* O. E. Schulz), 1066, 1067, 1069, *Rousseau*, nos. 24,833, 26,487, 26,613, 26,695, 26,703, *Victorin, Rolland & Jacques*, no. 33,586; crevices and talus of limestone sea-cliffs, alt. 200–275 m., east of St. Fabien, *Fernald & Collins*, no. 1068; rochers, Île à Deux Têtes, *Victorin*, no. 24,839; argilite, Île aux Grues, *Rousseau*, no. 24,841; Cap à la Branche, Île-aux-Coudres, *Victorin*, no. 4128; sur les roches cambriennes, Grosse-Îlse, *Victorin*, nos. 15,638, 15,639; dry calcareous cliffs near the shore, Baie St. Paul, *Stebbins*, no. 783; rochers abrupts, Mt. St.-Hilaire, *Victorin*, no. 3867; dry, calcareous cliffs, Gibraltar Point, Lake Memphremagog, *Pease*, no. 11,981. NEW BRUNSWICK: slaty bank, junction of Restigouche and Matapedia Rivers, Quebec-New Brunswick boundary, *Rousseau*, no. 32,335. MAINE: Mt. Kineo, September, 1887, *G. G. Kennedy;* moist ledges, at 1300 ft., Day Mt., Avon, July 24, 1903, *Knowlton*, August 31, 1904, *Knowlton & Chamberlain.* VERMONT: cliffs and summits about Willoughby Lake (Mt. Annance, Mt. Hor, Mt. Pisgah, etc.), many collections from 1854 (*Wm. Boott*)—date; Smuggler's Notch, many collections from 1877 (*Faxon*)—date; "in rupibus ripariis ad lacum *Champlain* et in Nova Anglia," *Michaux* (TYPE in herb. Michx., Mus. d'Hist. Nat. Paris); Gardiner's Island, L. Champlain, June 17, 1881, *Faxon*, July 2, 1898, *Eggleston;* Four Brothers Island, L. Champlain, June 12, 1908, *N. F. Flynn;* dry ledges, Shelburne Point, L. Champlain, June 25, 1913, *Knowlton;* Charlotte, June 9, 1876, *Pringle;* dry ledges, Mt. Philo, Charlotte, June 5, 1908, *Kennedy*, May 28,

1922, *Knowlton;* Snake Mt., Addison, *Eggleston*, no. 132; limestone cliffs, Cobble Hill, South Bristol, May 28, 1878, *Brainerd;* Mt. Eolus, Dorset, September, 1901, *E. H. Terry.* New York: southeast face of Wallface Mt., above southern end of Indian Pass, at 3200 ft. alt., Essex Co., *House*, no. 9436; rocky banks of lakes in St. Lawrence and Jefferson Counties, 1833 and 1834, *Asa Gray* (type of *D. incana*, var. *glabriuscula*); on rocks, Trenton Falls, June, ——, no. 72 (herb. Torrey); Sackett's Harbor, *W. A. Wood;* Burdick's Glen, Lansing, June 16, 1885, *Dudley;* dry rocks, small ravine north of Esty's Glen, Lansing, *A. J. Eames*, no. 12,081; near Akron, Erie Co., 1864, *Clinton.* Ontario: sand-dunes, Picton, June 26, 1886, *Fowler;* plentiful on Lake Muskoka, June, 1916, *N. Tripp* (Herb. Univ. Mich.); North Shore, Lake Superior (between Sault Ste. Marie and Michipicoten), *Loring;* Jack Fish, June 26, 1898, *J. Fletcher;* very abundant on cliffs and gravel, Jack Fish, *Pease*, no. 23,487; dry cliffs, Northern Slate Island, Thunder Bay Distr., *Pease*, no. 23,633; Mt. McKay, September 7, 1889, *Britton, Britton & Timmerman;* Lake Nipigon, July 8, 1884, *J. Macoun.* Michigan: Fort Gratiot, *Dr. Z. Pitcher* (type of *D. arabisans* β. Torr. & Gray and of *D. Longii*), in herb. Torrey; bluffs and ledges, Mackinac Island, July 2, 1897, *E. T. & S. A. Harper*, and numerous later collectors; limestone rocks, Prentis Bay, Mackinac Co., *Ehlers*, nos. 1103, 1352, *C. & E. Erlanson*, no. 648; Isle Royale, 1868, *G. A. Marr, A. E. Foote*, also *W. S. Cooper*, no. 40, in part (partly var. *canadensis*); base of Monument Rock, Isle Royale, *McFarlin*, no. 2174; island in Rock Harbor, Isle Royale, *McFarlin*, no. 2246; rock-crevices, Passage Island, August 25, 1930, *Povah & Brown;* wind-swept sandstone-conglomerate crest of Lookout Mt., Keweenaw Co., *Fernald & Pease*, no. 3316.[1] Wisconsin: bluffs on Point Washington, Door Co., June 21, 1891, *Schuette.* Minnesota: Grand Portage, ½ mile southeast of the village, *Rydberg*, no. 9666; talus below calcareous cliff, Grand Portage, *Butters & Buell*, no. 367. Plate 314 and 315, figs. 1, 2 and 5; map 21.

Var. canadensis (Brunet) Fern. & Knowlt. Rhodora, vii. 67, t. 60, fig. 12 (1905). *D. canadensis* Brunet, Cat. Pl. Can. 21 (1865); O. E. Schulz, l. c. 277 (1927), excluding var. *pycnosperma.*—Low, 0.7–1.5 dm. high; siliques elliptic-ovate, 3–8 mm. long, 2–4 mm. broad.—Scattered locally through the range, perhaps better treated as a form. Newfoundland: limestone cliffs and talus, Tucker's Head, Bonne Bay, *Fernald, Long & Fogg*, no. 1749. Quebec: rocher, Bic, *Rousseau*, no. 26,322 (as var. *orthocarpa*); crevices of rocks, St. Joachim, Cap Tourmente, 1864, *Ovide Brunet* (type collection), *Rolland*, no. 15,640. Michigan: Isle Royale, *Cooper*, no. 40, in part (mixed with typical *D. arabisans*); wind-swept sandstone-conglomerate crest of Lookout Mt., Keweenaw Co., *Fernald & Pease*, no. 3317, clearly an extreme of the plant with lanceolate siliques. Plate 315, figs. 3, 4 and 6.

[1] This station, discovered since map 21 was engraved, should be indicated by a dot near Keweenaw Point.

Draba arabisans is one of the clearest-cut perennial species of temperate eastern America, and its confusion with others has arisen through inadequate understanding of it or reliance upon mere outlines of siliques rather than upon its more significant characters (sufficiently emphasized in the key and the description above). The tortion of the silique (PLATE 314, FIGS. 2, 3 and 4), which is frequent or usual, may be quite lacking (PLATE 314, FIGS. 1 and 5 and PLATE 315) and similar tortion occurs in many other species. *D. arabisans*, var. *orthocarpa*, as already explained, in the discussion of *D. glabella*, as originally conceived was a mixture, the type-collection (PLATE 309) belonging with *D. glabella*. The remnant left in *D. arabisans* is not worthy special recognition, being merely plants with the siliques little or not at all twisted, a very inconstant character.

Var. *canadensis* (PLATE 315, FIGS. 3, 4 and 6) is, presumably, not a very significant extreme. It seems to be a minor variety with siliques of shorter and broader outline than usual. Its retention as a species by Schulz has been discussed, under *D. pycnosperma;* Schulz very evidently not understanding *D. canadensis* but giving under it a very full and accurate account of the wholly distinct plump-fruited *D. pycnosperma* (PLATE 306). In view of the great range of shape and size of the siliques (PLATES 314, 315), from narrowly lanceolate to elliptic or ovate and either twisted or plane, Schulz's description of them (his p. 275) as "lineari-lanceolatae" is peculiarly inadequate.

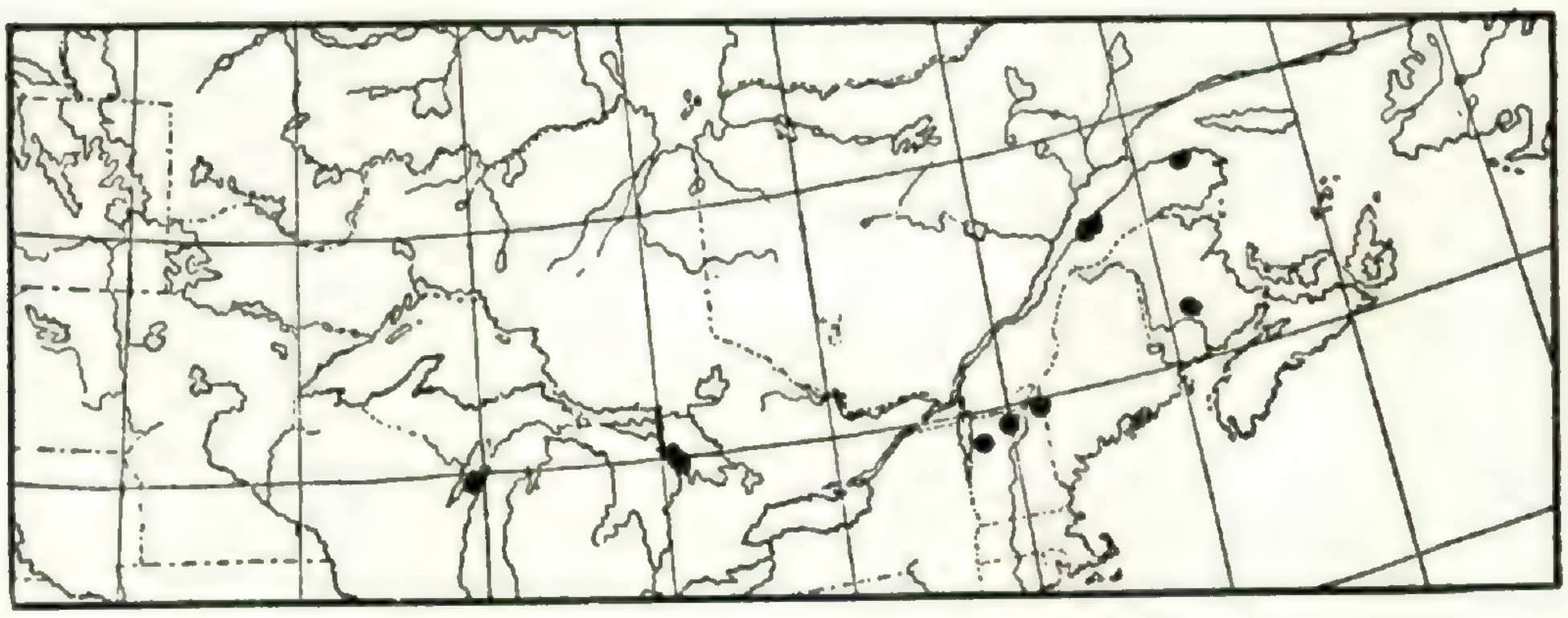
Although the characterization of *Draba arabisans* in *Das Pflanzenreich* assigns the species "Semina minora, vix 1 mm longa," I am unable, in the many hundreds of fruiting specimens now before me, to find well-developed seeds as short as 1 mm.; all good seeds are at least 1.1 mm. long and they range up to a length of 1.7 mm. In fact, flat-fruited *D. arabisans* can quickly be distinguished from *D. glabella* and its var. *orthocarpa*, with which it has been confused, by the seeds alone: in *D. arabisans* 1.1–1.7 mm. long, in *D. glabella* and var. *orthocarpa* 0.7–1 mm. long.

For discussion of Mrs. Ekmans quite untenable opinion that *D. arabisans* is a hybrid of *D. aurea* and *D. glabella* (*D. daurica*) see p. 251.

Ehlers, no. 1103, from limestone rocks, Prentis Bay, Mackinac Co. (Herb. Univ. Mich.), in mature fruit was recorded as *D. aurea* by Walpole, Proc. Mich. Acad. Sci. vi. 313 (1926).

18. D. LANCEOLATA Royle. *Perennial*, with simple to multicipital caudices, forming tufts or mats 0.2–1.5 dm. across; the caudex or its branches retaining many marcescent leaves or their shreds: *rosettes*

1.5–8 cm. across; *their leaves crowded*, oblanceolate or spatulate, entire or remotely dentate, 0.7–4 cm. long, 1–8 mm. broad, *cinereous with dense and soft stellate tomentum:* flowering *stems* 1–30, simple or branching, 0.5–3.5 dm high, *stellate-tomentulose* and very short-pilose: cauline leaves 2–10, lanceolate, oblong or narrowly ovate, entire, denticulate or coarsely dentate, somewhat stellate-tomentulose and often short-pilose, 0.5–3 cm. long: *racemes* dense to lax, *often leafy-bracted at base, in maturity elongating to* ⅓–⅘ *the full height of the plant: pedicels strongly ascending in fruit:* sepals narrowly oblong, pilose, 2–3 mm. long: petals white, obovate, emarginate, 3–5 mm. long: ovary stellate-pilose: *siliques linear-lanceolate to ellipsoid-ovoid, plump, with convex valves*, 4–14 mm. long, 1.5–2.5 mm. broad, *densely stellate-pannose*, twisted or plane; the style very short (up to 0.75 mm. long): seeds 20–48, 0.7–1 mm. long.—Illustr. Bot. Himal. Mts. i. 72 (1839); O. E. Schulz in Engler, Pflanzenr. iv[105]. 296 (1927). *D. incana* Reichenb. Ic. Pl. Crit. viii. 28, t. 769, fig. 1031 (1830); Gray, Man. ed. 5: 71 (1867), in large part; not L. *D. confusa* of many Asiatic authors, not Ehrh. *D. stylaris* Fern. & Knowlt. Rhodora, vii. 64, t. 60, figs. 3–5 (1905) and later Amer. authors; N. Busch, Fl. Sib. iii. 375 (1919); Pohle in Fedde, Repert. Beih. xxxii. 52 (1925); not J. Gay (1818), acc. to Schulz. *D. cana* Rydb. Bull. Torr. Cl. xxix. 241 (1902); O. E. Schulz, l. c. 298 (1927). *D. valida* Goodding, Bot. Gaz. xxxvii. 55 (1904); O. E. Schulz, l. c. 294 (1927).—Northern and alpine regions of Asia and North America; in America from eastern Quebec to Yukon, locally south to New Brunswick, northern New



Map 22. Eastern American Range of Draba lanceolata.

Hampshire, northern Vermont, Ontario, Michigan, Wisconsin, Colorado and Utah. The following are the eastern American specimens seen. Quebec: lower dry calcareous slaty talus of Mt. St. Pierre, Gaspé Co., *Fernald, Weatherby & Stebbins*, no. 2446; cold and shaded limestone-conglomerate ridge from Pointe aux Corbeaux to Cap Caribou, Bic, *Fernald & Collins*, no. 1077; crevices of dry calcareous rock, Cap Enragé, Bic, *Collins & Fernald*, no. 90; sur le conglomérat nu, au nord du Cap Enragé, Bic, *Rousseau*, no. 26,585; talus of limestone-

conglomerate sea-cliffs, alt. 200–275 m., east of St. Fabien, *Fernald & Collins*, no. 1078 (lax state); exposed crests of limestone sea-cliffs, east of St. Fabien, *Fernald & Collins*, no. 1079. NEW BRUNSWICK: dry rocks, Nashwaak, 1881, *J. Moser* in herb. N. B. Nat. Hist. Soc. NEW HAMPSHIRE: dry cliff, Diamond Peaks, Dartmouth College Grant, *Pease*, no. 20,614. VERMONT: dry cliffs, Willoughby, *Horace Mann, Edw. Tuckerman* and many others; dry alpine cliffs, Smuggler's Notch, Mt. Mansfield, August 2, 1893, *Eggleston*. ONTARIO: limestone boulders, foot of cliffs, Smoky Head, north of Lion's Head, Bruce Co., *Stebbins et al.*, no. 143; limestone ledges near shore of Georgian Bay, north of Dyer's Bay, Bruce Co., *Stebbins et al.* no. 144. MICHIGAN: crevices and talus of limestone cliff, Burnt Bluff, Delta Co., *Fernald & Pease*, no. 3318.[1] WISCONSIN: summit of cliff, Fish Creek, Door Co., *Fassett*, no. 15,566 (lax state). Mostly distributed as *D. incana* or *D. stylaris*. Previously cited specimens from Labrador and Newfoundland were erroneously identified. PLATES 316, 317, 318; MAP 22.

Draba stylaris J. Gay, to which our plant was referred by Knowlton and me when we pointed out its differentiation from the chiefly annual and biennial long-pilose *D. incana*, is, according to Schulz, one of the variants of *D. incana*, confined to continental Europe and the Caucasus. That being admitted it is necessary to seek the next available name for the perennial, matted, canescent plant of Asia and North America.

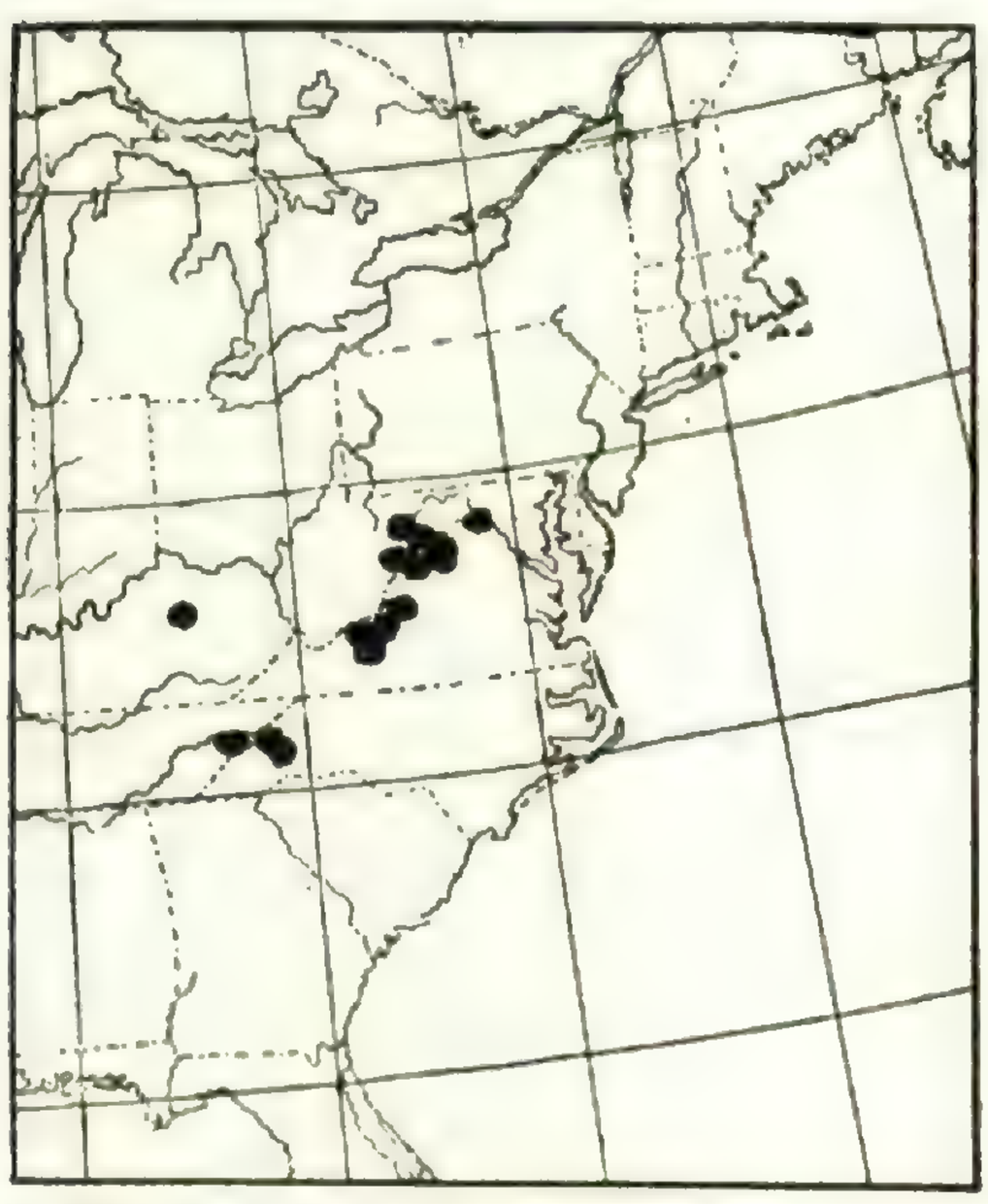
Although Schulz keeps apart as species *D. lanceolata* Royle (1839) (PLATES 317, FIGS. 1 and 2, and 318, FIG. 2) as strictly Asiatic, and *D. cana* Rydberg (1902) (PLATES 316, 317, FIGS. 3 and 4, and 318, FIG. 1) and *D. valida* Goodding (1904) (PLATE 317, FIG. 5) as strictly North American, I can get no satisfactory distinctions between them. They all show, furthermore, the well known arctic-alpine dispersal on the two continents and it is significant that, although Schulz maintains both *D. cana* (TYPE shown in PLATE 318, FIG. 1) and *D. valida* (TYPE shown in PLATE 317, FIG. 5) as species, Rydberg, who was not averse to maintaining weak species, has regularly united them in his later work. It is also significant that Schulz's description of *D. cana* consists merely of a comparison of it with *D. lanceolata*. The few differences pointed out by him, slight divergences in size of leaves and siliques, do not hold either in the Asiatic specimens before me nor in the larger American series (see PLATES 316–318).

DRABA CINEREA Adams, Mem. Soc. Nat. Mosc. v. 103 (1817) (*D.*

[1] The Michigan station should be added to MAP 22, on the peninsula 1 mm. (on the map) northeast of the Wisconsin station.

arctica J. Vahl, Fl. Dan. xiii. fasc. xxxix. 5, t. 2294 (1840)), has been found on the western side of Hudson Bay, as far south as Cape Henrietta Maria. It is likely to be found on the Labrador Peninsula. From *D. lanceolata* it differs in its few (1–4) remote cauline leaves, its fruiting racemes barely half the height of the plant and borne far above the upper leaf, and the seeds fewer (at most 36).

19. D. RAMOSISSIMA Desv. *Perennial*, forming broad mats (up to 2 or 3 dm. broad); the elongate humifuse branches and branchlets of the caudex covered below with marcescent shreds of old leaves and ending in rosettes 2–10 cm. across: *rosette-leaves* membranaceous, cuneate-oblanceolate, 1–5 cm. long, 2–15 mm. broad, minutely pilose, *with* 1–5 pairs of frequently *horizontally divergent narrow teeth* (sometimes with secondary teeth), or merely low-serrate: *flowering stems* 0.7–4.5 dm. high, *divergently branched above, forming corymbosely paniculate inflorescences*, pubescent with short branching, substellate and simple trichomes intermixed, leafy: cauline leaves 2–24 (rarely almost wanting), lanceolate, oblong, elliptic or ovate, acute, coarsely serrate to deeply pectinate, 0.5–4.5 cm. long, 0.1–2.2 cm. broad: *racemes corymbosely paniculate*, becoming very loose: pedicels filiform, elongate: sepals oblong or narrowly ovate, 2–3.3 mm. long: *petals white* or whitish, narrowly obovate or broadly spatulate, 5–7 *mm. long:* anthers about 0.5 mm. long: ovary pubescent: *siliques long-pedicelled, linear-lanceolate to elliptic-oblong, usually spirally twisted, stellate-pubescent*, 3–11 mm. long, with filiform *style* 1.5–3 *mm. long: seeds* 7–15, 1.2–1.8 *mm. long*.—Journ. de Bot. iii. 186 (1814); DC. Syst. ii. 355 (1821) and Prodr. i. 171 (1824); Torr. & Gray, Fl. N. Am. i. 106 (1838); Watson in Gray, Syn. Fl. N. Am. i[1]. 111 (1895); Britton in Britt. & Brown. Ill. Fl. ii. 142, fig. 1761 (1897); O. E. Schulz in Engler, Pflanzenr. iv[105]. 187 (1927). *D. arabisans* Pursh, Fl. Am. Sept. ii. 434 (1814), as to Virginia plant, not Michx. *Alyssum dentatum* Nutt. Gen. N. Am. Pl. ii. 63 (1818). *D. dentata* (Nutt.) Hook. & Arn. in Hook. Journ. Bot. i. 192 (1834); Hook. Icon. Pl. i. t. xxxi. (1837).—Cliffs and rocks, Virginia, West Virginia, Kentucky, Tennes-



MAP 23. Range of DRABA RAMOSISSIMA.

see and North Carolina, highly variable in size and toothing of leaves. The species is so very distinct and of such isolated range (as compared with the other and more northern perennial species) that it is unnecessary to cite the numerous specimens. Those examined come from the following counties. VIRGINIA: Page, Shenandoah, Rockingham, Rockbridge, Roanoke, Giles and Pulaski Cos. WEST VIRGINIA: Jefferson, Hardy, Grant and Pendleton Cos. KENTUCKY: Fayette Co. (and doubtless elsewhere). TENNESSEE: Cocke Co. NORTH CAROLINA: Madison and Buncombe Cos. Well illustrated, as *D. dentata* (Nutt.) Hook. & Arn. in Hook. Icon. Pl. i. t. xxxi (1837). MAP 23.

Draba ramosissima is one of the most distinct species of eastern North America. Although varying greatly in stature, size and depth of toothing of leaves and length of siliques it stands well apart from other American species. Schulz places it, along with *D. aurea*, *D. aureola* and other species with orange or yellow petals in his section *Phyllodraba* and includes it in his key under the call: "I. Flores flavi" (pp. 173, 174), though in the fuller description (p. 187) he slightly reduces the shock by saying "Petala dilute flava." The petals, according to those who have collected the plant, are the white of those of *D. arabisans*, *D. incana*, *D. glabella* and the others of Schulz's section *Leucodraba* ("Flowers white"—Torr. & Gray, Fl. No. Am. i. 106; "flowers white"—Gray, Man. ed. 2: 36; "flowers white"—Britton in Britt. & Brown, Ill. Fl. ii. 142; "petals white"—Small, Fl. Se. U. S. 480). So white are the petals that when Pursh (Fl. Am. Sept. 434) "collected specimens on the rocks near Harper's Ferry" (very possibly the type-station of *D. ramosissima*) he mistook it for the white-flowered *D. arabisans* Michx.

20. D. APRICA Beadle. *Annual* or winter-annual: stems 0.5–3.5 dm. high, simple below or loosely branched and stellate-puberulent; rarely with elongate branches above, but *with abbreviated or subsessile short corymbs in the middle and upper axils:* lower leaves obovate to rhombic-oval, coarsely

MAP 24. Range of DRABA APRICA.

2–4-dentate, thin, petioled, 0.7–2 cm. long, minutely strigose-hirtellous with irregularly stellate trichomes; cauline leaves remote, up to 17 in number, sessile, narrowly obovate to narrowly oblong or the upper linear-lanceolate, 0.5–2 cm. long, entire or sparsely dentate: *flowers apparently hermaphrodite, some apetalous, others petaliferous:* pedicels stellate-puberulent: sepals narrowly oblong, 0.8–1 mm. long: *petals,* when present, white, *spatulate,* 2.5–3 mm. long (acc. to Beadle): *siliques linear-ellipsoid,* 4–6 *mm. long, minutely stellate-puberulent,* tipped by a minute slender style: *seeds* 6, oblong-oval, 1–1.5 *mm. long.*—Beadle in Small, Fl. Se. U. S. ed. 2, Append. 1336 (1913); O. E. Schulz in Engler, Pflanzenr. iv[105]. 339 (1927).—Georgia: "common" on Kenesaw Mt., near Marietta, May 9, 1901, Biltmore Herb. (type, Herb. N. Y. Bot. Gard.); dry, open northern and northeastern slope, near the top, Kenesaw Mt., May 5 and 12, 1934, *L. M. Perry & M. C. Myers,* nos. 750, 751. Plate 319, figs. 8–10; map 24.

Draba aprica is little known. Until its rediscovery by Dr. Perry and Mr. Myers in the spring of 1934, the only material I had seen was the type sheet, which contains three fruiting specimens, two of them with the stems simple except for the abbreviated upper branches (fig. 8), the third a taller plant which might well have been 3.5 dm. high (the terminal raceme broken off) and bearing a few elongating axillary racemes, apparently a response to the breaking off of the top. The original label states that it is "common"; but Dr. Perry's experience indicates that, in 1934 at least, it is not abundant. I quote from her letter of May 28, 1934.

On May 5th I took the train [from Athens, Georgia] for Marietta, was joined by Mr. Myers, a former student of mine, and we proceeded to Mount Kenesaw. It is a rugged and rough hill in two parts. We were able to cover but one part that day between trains, and I must own that I was somewhat discouraged. We were almost to the top of the northeast slope before Mr. Myers, who was some ten feet ahead of me, stopped and said, "here it is, Dr. Perry," and handed me a specimen. We had been made so confident by the "common" on the label which you described that I couldn't understand what was the matter with my eyes. There were ten to fifteen plants in that spot. We found one other spot and that is all. The mountain is pretty open on top but I believe it had been burned over either early this spring or very late last fall. Anyhow, a job half done isn't done at all, and to convince you that I was painstaking about it, on my own I hired a car the next Saturday and that day we covered the other part of the mountain, somewhat more leisurely as we had no train to make. In all we probably found 50 *good* specimens, so I can assure you that the little *Draba* is very rare, this season at any rate.

Dr. Perry further informs me that *Draba aprica* is closely associated with *Viola Rafinesquii* Greene and *Oxalis violacea* L.

Schulz suggested that *Draba aprica* is to be compared with *D.*

DRABA ARABISANS: FIG. 1, portion of flowering branch, × 1, from Ontario; FIG. 2, fruiting branch, × 1, from type region, Lake Champlain, Vermont; FIG. 3, fruiting branch, × 1, from Quebec; FIG. 4, fruiting raceme, × 1, from type region, Lake Champlain; FIG. 5, silique, × 10, from type region; FIG. 6, small rosette-leaf, × 10, from Newfoundland.

Draba arabisans: fig. 1, portion of fruiting branch, × 1, of short-fruited plant (isotype of *D. megasperma*, var. *leiocarpa* O. E. Schulz) from Bic, Quebec; fig. 2, short fruiting raceme, × 1, from Percé, Quebec; fig. 4, small plant, × 1, approaching var. canadensis, from Newfoundland; fig. 5, silique, × 10, from fig. 1.

Draba arabisans, var. canadensis: fig. 3, fruiting raceme, × 1, of isotype, from Cape Tourmente, Quebec; fig. 6, silique, × 10, from fig. 3.

DRABA LANCEOLATA: FIG. 1, portion of slender fruiting plant, × 1, from Quebec; FIG. 2, portion of slender fruiting plant, × 1, from Ontario; FIG. 3, center of rosette, × 10, from Quebec; FIG. 4, portion of internode, × 10, from Quebec; FIG. 5, silique, × 10, from Vermont.

DRABA LANCEOLATA: FIG. 1, flowering plant, × 1, from Ajan, Siberia; FIG. 2, fruiting plant, × 1, from Songaria; FIG. 3, flowering stem, × 1, from Vermont; FIG. 4, fruiting plant, × 1, from Quebec; FIG. 5, fruiting plant, × 1, from Utah (isotype of *D. valida* Goodding).

DRABA LANCEOLATA: FIG. 1, low branching plant (type of *D. cana* Rydb.), × 1, from Alberta; FIG. 2, flowering plant, × 1, from eastern Siberia.

DRABA BRACHYCARPA: FIG. 1, fruiting plant, × 1, from Indiana; FIG. 2, small-flowered plant, × 1, from Tennessee; FIG. 3, large-flowered plant, × 1, from Virginia; FIG. 4, large-flowered plant, × 1, from Missouri; FIG. 5, fruiting plant, × 1, from Tennessee; FIG. 6, silique, × 10, from FIG. 5; FIG. 6, septum and seeds, × 10, from FIG. 5.

DRABA BRACHYCARPA, var. FASTIGIATA: FIG 11, TYPE, × 1; FIG. 12, siliques, × 10, of TYPE.

DRABA APRICA: FIG. 8, TYPE, × 1; FIGS. 9 and 10, silique and septum with seed, × 10, from TYPE.

brachycarpa Nutt., var. *fastigiata* Nutt. in Torr. & Gray, Fl. N. Am. i. 108 (1838) and he published the needless binomial "Nuttall 1825 als *Draba fastigiata* msc. in hb. Delessert!"—Schulz, l. c. 339 (1927). *D. brachycarpa*, var. *fastigiata* was separated from typical *D. brachycarpa* as "more pubescent; stem mostly simple; radical leaves mostly 4-toothed; silicles pubescent."

Whether *Draba aprica* should include *D. brachycarpa* var. *fastigiata* is at present not wholly clear. The type sheet of *D. brachycarpa* from the Torrey Herbarium is before me. It consists of the original Nuttall material from Arkansas, four plants at the top of the sheet; and at the bottom the plants from Millidgeville, Georgia, *Boykin* and from Macon, Georgia, *Loomis*, originally cited for *D. brachycarpa*, and a third and different specimen without designation of locality but presumably from near St. Louis, Missouri, the fourth locality given by Torrey & Gray. The four specimens of the original Nuttall collection from Arkansas are two branching plants which must stand as the type of Nuttall's species and which are thoroughly typical of that species as understood. Alternating with them on the sheet are two unbranched individuals, one with the raceme gone, the other (FIG. 11) with a compact terminal raceme of a few stellate-pubescent oblanceolate siliques (FIG. 12). The two simple specimens are marked in Nuttall's hand *D. fastigiata* and must stand as the type of *D. brachycarpa*, var. *fastigiata*. In view of the fact that the larger specimen of the two has lost its raceme, I refrain from opening one of the immature siliques of the remaining individual. The seeds of this plant, if mature, would quickly settle whether it is a very unusual variation of *D. brachycarpa* (PLATE 319, FIGS. 1–7), which otherwise has oblong and glabrous siliques, or a very dwarf and atypical representative of the highly localized *D. aprica*. The collections in the Gray Herbarium and at the New York Botanical Garden show no *D. brachycarpa* with pubescent siliques; and, in view of the presence on Nuttall's sheet of specimens of typical *D. brachycarpa* from two Georgia stations, it is not impossible that the two plants of var. *fastigiata* came, not from Arkansas, as supposed, but from Kenesaw Mt. in Georgia, which is easily reached from Atlanta. Students of the Arkansas flora should watch for and, if possible, collect material to settle this dilemma.

21. D. BRACHYCARPA Nutt. *Annual or biennial* (forming rosettes the first year): *stems simple or more commonly bushy-branched* either from the base or from the upper axils, stellate-hirtellous or -strigose,

0.4–2 dm. high: basal leaves elliptic, oval or obovate, petioled, 0.5–2 cm. long, stellate-pubescent; cauline leaves 3–12, smaller and narrower, sessile, the upper nearly linear: *racemes* at first dense, *in fruit becoming lax* and up to 7.5 cm. long: pedicels spreading-ascending, glabrous to stellate-hirtellous, the lower becoming 1–5 mm. long: *flowers dimorphic or trimorphic,*[1] the smaller apetalous, others with small narrow petals, others with conspicuous white petals: sepals oblong to ovate (in larger flowers), 1–1.5 mm. long, glabrous or sparsely pilose: *larger petals obovate*, 2–3 mm. long: *pistils glabrous, with* 10–16 *ovules: siliques oblong-ellipsoid,* 1.7–5 *mm. long, glabrous: seeds* 0.5–0.8 *mm. long*.—Nutt. in Torr. & Gray, Fl. N. Am. i. 108 (1838); Darby, Man. Bot. ii. 24 (1841); Gray, Man. ed. 2: 37 (1856); Chapm. Fl. So. U. S. 29 (1860); Watson in Gray, Syn. Fl. N. Am. i.[1] 107 (1895); Britton in Britton & Brown, Ill. Fl. ii. 143, fig. 1762 (1897); Small, Fl. Se. U. S. 480 (1913); O. E. Schulz in Engler, Pflanzenr. iv[105]. 338, fig. 32 (1927). ?*Discovium gracile* Raf. Journ. de Phys. lxxxix. 96 (1819). ?*Discovium Ohiotense* DC. Syst. ii. 700 (1821). *Alyssum bidentatum* Nutt. ex Torr. & Gray, l. c. (1838) as syn. *Abdra brachycarpa* (Nutt.) Greene,

[1] "This humble white flower is at this season very abundant on the grassy hills about town, associated with *Draba Caroliniana*, the pretty *Houstonia minima*, with *Androsace occidentalis*, *Plantago pusilla*, *Ranunculus fascicularis*, *Myosurus minimus*, and the completely naturalized *Capsella*. In ordinary or in wet springs the flowers are all regularly formed and comparatively large, having a diameter of about 2 lines; in very dry springs, however, such as the present one, a form with very inconspicuous flowers becomes common, which in isolated specimens in the herbarium might be taken for a distinct species, but, studied on its native hills in thousands of specimens, clearly proves to be nothing but a depauperate or abortive state and not even a clearly defined variety.

During a late excursion to our commons in company with Dr. Hilgard, he ascertained that on the northern slopes of hills and sinkholes, and near the edge of ponds, the plant had the ordinary appearance, but on the sunny and dry or even arid southern slopes not a single one among the thousands of specimens could be found the flowers of which were not quite inconspicuous; in intermediate situations the size and organization of the flowers were also intermediate.

These incomplete flowers are smaller in all their parts than the regular ones; the sepals are erect and rather persistent; the petals always shorter than the sepals, but variable in size, shape, and number, or even entirely absent; the stamens always abortive and often reduced in number; the ovary shorter but fertile.

The petals ordinarily broadly obovate-spatulate, retuse, over 1 line long, are here linear-spatulate, entire, emarginate or bilobed, 1/6–1/3 line long, 2 or 4 in a flower, often of unequal size in the same flower, or entirely absent. The slender filaments bear a bilobed cellular head, often not more than 0.05 line long, representing the anther, but without any regular structure. He found in single flowers 4, and often 5 or 6 of them, without petals, or associated with 2 or 4 rudimentary petals. It appears that in some incomplete tetrandrous flowers the pairs of stamens adhere to the base of the corresponding exterior, and the pairs of petals to that of the interior sepals; the 8 organs forming rather one than two cycles.

How these female plants, as they must be called, which, this spring at least, form the immeasurably largest part of the whole crop, can be fertilized by the few complete ones growing in the neighborhood, is not easy to understand.

Does not this dimorphism obtain in other species of this genus, in *Lepidium* and other *Cruciferae*, and would not several so-called species fall, if correctly understood, under other fully developed ones as incomplete forms?"—Engelm. Trans. Acad. Sci. St. Louis, ii. 154 (1862).

Pittonia, iv. 207 (1900). *D. brachyc.*, vars. *apetala* and *grandiflora* Engelm. ex O. E. Schulz, l. c. 339 (1927) as syns. *D. bidentata* Nutt. ex O. E. Schulz, l. c. 339 (1927) as syn.—Dry to moist open soil and waste ground, northern Florida to Texas, north to Virginia, southern Ohio (?), Indiana, Illinois, Missouri and Kansas; also (adventive?) in Oregon. Flowers late winter and early spring. PLATE 319, FIGS. 1–7.

For discussion of the problematical *Draba brachycarpa*, var. *fastigiata* see notes under *D. aprica*.

Draba brachycarpa is inclined to be a weed of roadsides and waste places and its present northern limits have doubtless been extended beyond its primitive range.

There are two names earlier than *Draba brachycarpa* (1838) which need explanation. Here possibly belongs *Discovium gracile* Raf. (1819), "Trouvé en juin sur les rives de l'Ohio, près de Gallipolis." Rafinesque's description, save for "Fleurs jaune" (an error independently committed by some later authors) and for the month June, which is rather late, strongly suggests that he had *Draba brachycarpa*, although I know of no evidence of the species now being found in Ohio (it is in Tennessee, Indiana and Illinois). I have seen none of Rafinesque's material but it is apparently preserved in the De-Candolle herbarium at Geneva. Should it prove, as I surmise, to be *Draba brachycarpa*, *Discovium gracile* (1819) cannot displace the name *Draba brachycarpa* (1838) because of *Draba gracilis* Graham (1828). A complicating situation arises through the fact that De-Candolle in 1821 called Rafinesque's species *Discovium Ohiotense*, without citing *Discov. gracile* as a synonym. Consequently, it might plausily be urged that De Candolle's specific epithet should be used (when and if the species proves to be *Draba brachycarpa*). It should be noted, however, that DeCandolle exactly translated Rafinesque's French diagnosis of *Discov. gracile* into Latin and added nothing to it, even citing the identical habitat: "Ad ripas fluminis Ohio prope Gallipoli." It should be evident, therefore, that, although he did not mention *Discov. gracile* Raf. as the basis of his *Discov. Ohiotense*, DeCandolle was, in fact, publishing a needless new name for it. As an illegitimate name, *Discov. Ohiotense* cannot be taken up to displace the legitimate *Draba brachycarpa*, even though it antedates it by seventeen years.

22. D. NEMOROSA L. *Annual or winter-annual* 0.5–3 dm. high, *simple or with few ascending branches: stem hispid* with simple, bifurcate and stellate trichomes variously intermixed: *rosette-leaves*

oblong-obovate or elliptical, obtuse, with pubescence as on the stem, subentire or remotely dentate: *cauline leaves* 0–7 *on the primary axis,* 1–5 *on the branches,* oblong to ovate, acute, with 2–6 pairs of teeth: *raceme* corymbiform in anthesis, *becoming elongate and very lax and up to nearly the full height of the plant:* sepals 1.5 mm. long, oblong or narrowly ovate, obtuse: *petals pale yellow, becoming white, narrowly cuneate, about* 2 *mm. long: fruiting pedicels widely spreading* to subascending, often arching, filiform, 0.7–2(–2.5) *cm. long: siliques narrowly oblong,* 3–13 *mm. long, minutely strigulose-hispid:* seeds 30–50.—Sp. Pl. 643 (1753); Gray, Man. ed. 2: 37 (1856); Wats. in Gray, Syn. Fl. N. Am. i[1]. 107 (1895); Britton in Britt. & Brown, Ill. Fl. ii. 143, fig. 1763 (1897); O. E. Schulz in Engler, Pflanzenr. iv[105]. 309 (1927), which see for detailed citations; Rydb. Fl. Prair. Pl. Centr. N. Am. 379, fig. 252 (1932). *D. muralis,* β. L. Fl. Suec. ed. 2: 224 (1755). *D. nemoralis* Ehrh. Beitr. vii. 154 (1792); Hook. Fl. Bor.-Am. i. 55 (1830); Torr. & Gr. Fl. N. Am. i. 108 (1838); Gray, Man. 39, (1848). *D. nemorosa,* β. *hebecarpa* Lindbl. Linnaea, xiii. 333 (1839). *D. nemoralis,* α. *genuina* Boiss. Fl. Orient. i. 303 (1867). *D. nemorosa,* α. *typica* Beck von Man. Fl. Nied.-Öst. 472 (1892). *D. nemoralis,* var. *hebecarpa* (Lindbl.) Lehm. Fl. Poln.-Liv. 315 (1895). *Crucifera nemorosa* (L.) E.H.K. Krause in Sturm, Fl. Deutschl. ed. 2, vi. 61 (1902). *D. nemorosa,* var. *genuina* N. Busch in Kusnezow, Busch & Fomin, Fl. Cauc. Crit. iii[4]. 406 (1909), ascribed to Boiss. l. c.—Dry open soils through much of western North America, from northern British Columbia to Nevada and Utah, east to Manitoba and South Dakota, very locally to western Ontario and Michigan; Eurasia.

The plants with siliques only 3–6 mm. long have been called

Forma BREVISILIQUA (Zapalowicz) N. Busch, Fl. Sib. iii. 389 (1919). Var. *brevisiliqua* Zapalowicz, Consp. Fl. Galic. Crit. xxv. in Rozpr. Wydz. Mathem.—Przyr. Akad. Umiej. ser. 3, xiiB, 238 (1912), acc. to Schulz, l. c. 313.

The plants with large siliques (9–13 mm. long, 2–2.5 mm. broad) have been called

Forma MACROLOBA Pohle in Fedde, Repert. Beih. xxxii. 3 (1925).

Var. LEJOCARPA Lindbl.—*Siliques glabrous.—D. lutea* Gilib. Fl. Lith. ii. 46 (1781); DC. Syst. ii. 351 (1821) and Prodr. i. 171 (1824); Hook. Fl. Bor.-Am. i. 55 (1830); Rydb. Fl. Rky. Mts. 352 (1917) and later works. *D. muralis,* b. *Draba intermedia* H. de Martius, Fl. Mosq. 111. (1812). *D. gracilis* Graham, Edinb. New Phil. Journ. iv–ix. 172 (1828). *D. nemorosa,* α. *lejocarpa* Lindbl. Linnaea, xiii. 333 (1839); O. E. Schulz, l. c. 314 (1927), which see for much further bibliography. *D. nemoralis,* β. *glabra* Fleischer & Lindem. Fl. Esth.-Liv.-u. Kurland, 230 (1839). *D. nemorosa,* var. *lutea* (Gilib.) Fries, Summ. Veg. Scand. i. 31 (1846). *D. nemorosa,* a. *glabra* (Fleisch. & Lindem.) Schur, Enum. Pl. Transsilv. 66 (1866). *D. nemoralis,* β. *lejocarpa* (Lindbl.) Boiss. Fl. Orient. i. 303 (1867). *D. dictyota*

Greene, Pittonia, iv. 313 (1901).—Alaska to Colorado, eastward to Hudson Bay (Churchill, *J. M. Macoun*, no. 79,070) and Lake Superior,[1] Ontario and Minnesota; locally introduced eastward to QUEBEC: "Apparement naturalisé de l'Ouest," Lac Deschenes, 26 mai 1923, Herb. Univ. Montr. no. 17,416. Eurasia.

23. D. CUNEIFOLIA Nutt. Annual or winter annual (forming rosettes the first year, flowering and fruiting in earliest spring): *stem simple or branching from near the base*, in anthesis 0.2–1.5 dm. high, in fruit elongating to 0.5–2.8 dm. high, *hispid from base to summit* with simple, bifurcate and minute stellate hairs; *leaves basal and at the lower nodes and at bases of the* arched-ascending *branches*, cuneate-obovate, obtuse, mostly 1–3 cm. long, *coarsely dentate*, *hispid* with stipitate and sessile forking trichomes: raceme in anthesis corymbiform, *elongating* in fruit *to a lax raceme* $\frac{1}{3}$–$\frac{1}{2}$ *the height of the plant: flowers dimorphic or trimorphic*, those of the primary raceme large and showy, of the lateral ones either large or with minute petals or apetalous, or all of them minute:[2] sepals of the larger flowers 1.8–2.5 mm. long, oblong, obtuse, the outer hispid; of the small flowers 1–1.6 mm. long, hispid: larger petals white, elliptic to broadly spatulate, 3–5 mm. long: anthers of the larger flowers 0.2–0.4 mm. long, of the smallest minute or wanting: *fruiting pedicels pubescent*, *horizontally divergent* or upwardly arching, 3–8 *mm. long:* siliques broadly linear to narrowly oblong, compressed, obtuse to subacute, without apparent style, 6–16 mm. long, 1.6–2.5 mm. broad, strigose-setulose, with 20–48 seeds.—Nutt. in Torr. & Gray, Fl. No. Am. i. 108 (1838); Wats. Bibl. Ind. i. 59 (1878), many references, and in Gray, Syn. Fl. N. Am. 1^1. 107 (1895); Britton in Britt. & Brown, Ill. Fl. ii. 141, fig. 1757 (1897); Rob. & Fern. in Gray, Man. ed. 7: 422, fig. 777 (1908); O. E. Schulz in Engler, Pflanzenr. iv^{105}. 333 (1927). *D. filicaulis* Scheele, Linnaea, xxi. 583 (1848).—Dry rocky or sandy soil, barrens and open woods, Florida to Texas and northern Mexico, north to Kentucky, southern Illinois, Missouri, Kansas and Colorado.

West of our range passing into

Var. LEIOCARPA O. E. Schulz, l. c. 334 (1927).—Siliques glabrous.—Arkansas and Louisiana to Arizona.

Var. HELLERI (Small) O. E. Schulz.—Siliques ellipsoid-oblong, strigose, 4–8.5 mm. long, on pedicels only 1–3 mm. long: seeds fewer.—O. E. Schulz, l. c. (1927). *D. Helleri* Small, Fl. Se. U. S. 479 (1903). *D. ammophila* Heller, Muhlenbergia, i. 145 (1906).—Texas to southern California, locally north to Washington.

[1] In Agassiz, Lake Superior, 155 (1850), after listing *Draba arabisans*, Agassiz made the note: "A small species of Draba with yellow flowers, found at Michipicotin, was lost." This was undoubtedly *D. nemorosa*, var. *lejocarpa*, for the National Herbarium at Ottawa has a characteristic sheet of the latter: dry sand hills and banks, Michipicotin, July 27th, 1869, *John Macoun*, the number juggled in a misleading way. "No. (447. 178) 2014."

[2] See quotation from Engelmann under discussion of *D. brachycarpa*.

24. D. **reptans** (Lam.), comb. nov. Annual or winter-annual: *stems* filiform, *simple or* slightly to freely *branching at base*, the larger plants with depressed or diffuse branches, 0.2–1.5 dm. high, *hispid below* with simple, forking and sessile stellate hairs, *glabrous above and on the rachis: leaves in a basal rosette and* 1 or 2 pairs or groups of 3 *crowded above it or at the base of the otherwise scapiform branches*, spatulate-obovate, rounded at summit, *entire or nearly so, bristly-ciliate*, the upper surface coarsely bristly with long simple trichomes and often stellate, *the lower surface with stellate and forking hairs: raceme in fruit short and subumbelliform, its axis* 0.3–4 cm. long, *glabrous: flowers dimorphic;* the larger with oblong sepals about 2 mm. long and obovate white petals 3–5 mm. long; the smaller with narrowly oblanceolate petals equaling or shorter than the narrow sepals or wanting: *fruiting pedicels divergent or arched-ascending*, 1–7 mm. long, *glabrous: siliques* linear to narrowly oblong, obtuse, 0.5–2.2 cm. long, *glabrous:* seeds 15–60 (–80).—*Arabis reptans* Lam. Encycl. i. 222 (1783); Willd. Sp. Pl. iii[1]. 536 (1800); DC. Syst. ii. 242 (1821); Torr. & Gray, Fl. No. Am. i. 83 (1838). *D. caroliniana* Walt. Fl. Carol. 174 (1788); Willd. Sp. iii[1]. 427 (1800); Nutt. Gen. N. Am. Pl. ii. 62 (1818); DC. Syst. ii. 353 (1821) and Prodr. i. 171 (1824); and essentially all later authors, including O. E. Schulz in Engler, Pflanzenr. iv[105]. 331, fig. 31 (1927). *D. hispidula* Michx. Fl. Bor.-Am. ii. 28 (1803). *D. umbellata* Muhl. Cat. 60 (1813), renaming of *D. caroliniana* Walt. *Arabis rotundifolia* Raf. Am. Mo. Mag. ii. 43 (1817). *Tomostima caroliniana* (Walt.) Raf. Neogenyton, 2 (1825). *T. hispidula* (Michx.) Raf. l. c. (1825). *D. caroliniana*, β. *umbellata* Torr. & Gray, Fl. N. Am. i. 109 (1838), the longest-fruited extreme = *D. caroliniana*, var. *dolichocarpa* O. E. Schulz, l. c. 333 (1927).—Dry sands and ledges, Georgia to New Mexico, north to eastern Massachusetts. Rhode Island, Connecticut, southeastern and northern (Sackett's Harbor, *Vasey* in Gray Herb.) New York, eastern Pennsylvania, southern Ontario, Michigan, Wisconsin, Minnesota, North Dakota and Colorado; also locally, Washington and Oregon.

Var. **micrantha** (Nutt.), comb. nov. Siliques minutely hispid.—*D. micrantha* Nutt. in Torr. & Gray, Fl. N. Am. i. 109 (1838); Gray, Man. ed. 2: 37 (1856); Small, Fl. Se. U. S. 479 (1903); Rydb. Fl. Rky. Mts. 352 (1917). *D. caroliniana*, var. *micrantha* (Nutt.) Gray, Man. ed. 5: 72 (1867); Wats. in Gray, Syn. Fl. N. Am. i[1]. 106 (1895); Britton in Britt. & Brown, Ill. Fl. ii. 141 (1897); O. E. Schulz, l. c. 333 (1927). *D. coloradoensis* Rydb. Bull. Torr. Bot. Cl. xxxi. 555 (1904).—Chiefly western, Louisiana to southern California, north to Illinois, Minnesota, South Dakota, Montana and Washington.

The necessity to change the specific epithet arises through the fact that earlier authors, some of them cognizant of the properly published *Arabis reptans* Lam., have failed to apply the priority principle, which it is often a temptation to overlook! Willdenow, DeCandolle

and others in Europe, unfamiliar with American plants, accepted *A. reptans* at its face value as an Arabis; and even Pursh, who should have known better, kept it up as *A. reptans* from "sandy fields: Pennsylvania to Virginia" (Pursh, Fl. Am. Sept. 437) and on another page (433) maintained *Draba hispidula* Michx. (with the earlier *D. caroliniana* Walt. as a synonym), apparently without suspecting the identity. The recognition of the probable identity apparently started with Torrey & Gray, who relegated *A. reptans* to the doubtful species, with the pertinent query: "Is it Draba Caroliniana?" In his Bibliographic Index (1878) Watson entered *A. reptans* doubtfully in the synonymy of *D. caroliniana,* but in the Synoptical Flora the doubt was unexpressed; and Schulz gives this name of 1783 unequivocally in the synonymy of *D. caroliniana* (1788).

Draba reptans rests upon *Arabis reptans* Lam. which was based solely on *Paronychia Myosotis Virginiana, foliis subrotundis* of Plukenet, Phytogr. t. li. fig. 5 (1691) and Almag. 281 (1699). Plukenet's figure, like so many of his drawings of American plants, is very definite to one who knows the flora. It is here reproduced as TEXT-FIG. 1; and it is well matched by many specimens from eastern America, while Lamarck's description of it is unequivocal.

FIG. 1. Type of DRABA REPTANS, after *Plukenet.*

The maintenance by some authors of *D. micrantha* or *D. coloradoensis* as a species merely because it has hispid, instead of glabrous siliques, seem unjustified. Similar variations without other characters occur in many species: for example, *D. nemorosa* (typical) with siliques strigose-hispid, var. *lejocarpa* (*D. lutea*) with them glabrous; *D. cuneifolia* with strigose-hispid siliques, var. *leiocarpa* with them glabrous, etc., etc.

25. D. VERNA L. *Small annual or winter-annual*, flowering chiefly in early spring: *leaves all in a basal rosette*, oblanceolate or spatulate, entire or dentate, more or less pilose on the upper surface with simple, bifurcate and stellate trichomes, 0.5–2.5 cm. long: *scapes* 1–several and very unequal, *filiform*, in fruit elongating to 0.3–3 dm. high, glabrous or nearly so: *raceme* at first corymbiform, *in fruit becoming elongate and lax, the lower pedicels then* 0.4–3 *cm. long*, ascending: sepals ovate to obovate, with rounded tips, 1–2 mm. long, glabrous or hispid on the back: *petals* white, *bifid half their length*, 1.5–2.5 mm. long: *siliques narrowly oblong-elliptic*, 4–10 mm. long, 1.5–2.3 mm. broad, glabrous, with 40–60 seeds.—Sp. Pl. 642 (1753); Pursh, Fl. Am. Sept. 433 (1814); Barton, Fl. N. Am. iii. 49, t. 88 (1823); Torr. & Gray, Fl. N. Am. i. 109 (1838); Watson in Gray, Syn. Fl. N. Am. i.[1] 106 (1895). *Erophila vulgaris* DC. Syst. ii. 356 (1821). *E. verna* (L.) E. Meyer in Preuss, Pflanzengatt. 179 (1839); O. E. Schulz in Engler. Pflanzenr. iv[105]. 345 (1927), which see for very detailed bibliography.—Roadsides, fields and other open, dry habitats, Massachusetts to Ohio, Kentucky, Tennessee and North Carolina; southern British Columbia to California. Naturalized from Europe. Much less frequent than

Var. AESTIVALIS Lejeune.—*Siliques broadly elliptic, elliptic-obovate or rounded*, 2.5–6 mm. long, 2–4 mm. broad; seeds fewer.—Rev. Fl. Env. Spa, 128 (1824); Wildem. & Dur. Prodr. Fl. Belg. iii. 346 (1899). *D. Boerhaavii* Van Hall, Specim. Bot. 149 (1821). *D. verna* Bigel. Fl. Bost. ed. 2: 250 (1824); Gray, Gen. i. 160, t. 69 (1848); Britton in Britt. & Brown, Ill. Fl. ii. 140, fig. 1755 (1897). *Erophila Boerhaavii* (Van Hall) Dumortier, Fl. Belg. 120 (1827); O. E. Schulz, l. c. (1927), which see for many synonyms and references.—More frequent, Massachusetts to southern Ontario, south to Georgia and Tennessee; Washington and Oregon. Naturalized from Europe.

Var. *aestivalis* is treated as a species, *Erophila Boerhaavii*, by Schulz, distinguished in his key from *E. verna* by "Siliculae abbreviatae, breviter obovoideae vel subrotundatae. Ovarium 24–48-ovulatum" as opposed to the "Siliculae oblanceolate" and "Ovarium 44–60-ovulatum" of *E. verna*. But in the detailed descriptions the "oblanceolate" siliques of *E. verna* become "oblongo-ellipsoideae," while *E. verna*, var. *oedocarpa* (E. Drabble) O. E. Schulz has them "anguste obovato-lanceolatae," var. *cochleata* (Rosen) O. E. Schulz has them "ovoideae, subtumideae," and var. *Charbonnelii* (H. Sudre) O. E. Schulz has them "6 mm longae, 2,5–3 mm latae," proportions most difficult to reconstruct into "*oblanceolate*." Incidentally, the key-character of *E. Boerhaavii*, "Ovarium 24–48-ovulatum," changes in the fuller description to "Ovarium ovulis 32—18."

I have, consequently, taken up, with full appreciation of the possible doubt involved, the name *Draba verna*, var. *aestivalis* Lejeune. In an Old World group wherein some authors have seen nearly 200 "species" while others (Rouy & Foucaud, for example) see in France alone 8 subspecies with 57 recognized varieties and forms it is not safe to be dogmatic. Lejeune's brief description is satisfactory:

Var. aestivalis N. siliculis ovatis, convexis, pedicello brevioribus; foliis sublinearibus.
Obs. La première variété . . . , la deuxième [var. *aestivalis*] se distingue par la forme de ses fruits qui sont beaucoup plus courts et à valves bombées, ce qui leur donne une forme plus arrondie.

Schulz cites *Draba verna*, var. *aestivalis* (1824) as an unquestioned synonym of his *Erophila Boerhaavii*, but he also gives, as his basis of *E. Boerhaavii* the earlier "*Draba verna* L. β. *Boerhaavii* Van Hall, Specim. bot. (1821) 149." I have not seen Van Hall's account, but it is significant that in quoting it (his footnote, p. 359) Schulz makes it clearly appear that Van Hall was publishing a binomial, *D. Boerhaavii:*

A *Draba verna vulgari* valde differt siliculis duplo latioribus et brevioribus, statura longe minori. Nonne haec insignis formae siliculae differentia satis magni momenti est habenda, ut tamquam s p e c i e s, nomine *Drabae Boerhaavii*, a *D. verna* distinguatur? (H a l l l. c.).

Index Kewensis, likewise, gives *Draba Boerhaavii* Van Hall unequivocally as a binomial.

Another set of synonyms usually cited under *Draba verna* rests for typification directly upon *D. verna*, β. *americana* Pers. Syn. ii. 190 (1807). These are *Erophila americana* (Pers.) DC. Syst. ii. 356 (1821); *E. vulgaris*, var. *americana* (Pers.) Darl. Fl. Cestr. 378 (1837) and *D. americana* (Pers.) Hook. f. & Jackson, Ind. Kew. ii. 792 (1893). The pedicels of *D. verna* are ordinarily strongly ascending or but slightly arching: but the brief description given by Persoon under *D. verna* was

β. *americana*, silicul. longioribus deflexis. Hab. in Europae et Americae aridis,

a wholly unconvincing account of a plant with ascending fruit! Later authors doubtless had forms of *D. verna* before them but it is doubtful if Persoon did. *Erophila verna*, var. *americana* (Pers.) O. E. Schulz, l. c. 355 (1927) is kept up by Schulz for a plant of Europe and of "Arkansas (R a f i n e s q u e, hb. Deless.)" but he says nothing about the siliques being "deflexed."

(*To be continued*)

HOST PLANTS OF CUSCUTA GRONOVII[1]

H. L. Dean

During the summer of 1930 while studying the flora of West Virginia the writer had most favorable opportunity for observing the host relations of *Cuscuta Gronovii* Willd. This species of *Cuscuta* occurring, as it does, very commonly throughout the state facilitated the many observations made. At the suggestion of Professor P. D. Strausbaugh, of West Virginia University, a record of host plants was compiled for this species of dodder.

Since subsequent examination of the literature indicates that no extensive list of specific host plants for *C. Gronovii* has been published, it is believed that the appended list should be of interest. Although practically all representative areas of West Virginia were visited by the writer, doubtless further study would add new species to the present list.

Early writers believed that a given species of *Cuscuta* infested only one species of host plant. In harmony with this belief Engelmann (1842) in his earlier monograph of the genus named several species of *Cuscuta* after the genera of plants upon which they grew. A year later (1843) he published his "Additions and Corrections to a Monography of North American Cuscutineae" and stated: "I am now convinced, that, although many Cuscutae prefer some plants to others, yet there is no constancy in this respect, but the same species often grows upon a great variety of widely different plants. I did wrong, therefore, to name them from the genera upon which they grew; and I should much prefer to see the names of *C. Cephalanthi* changed into *C. tenuiflora*, *C. Coryli* into *C. incurva*, *C. Saururi* into *C. umbrosa* Beyr.?, *C. Polygonorum* into *C. chlorocarpa*, and *Lepidanche Compositarum* into *L. squarrosa*, if they had not yet been published."

Hooker (1899) reported *C. Gronovii* as parasitizing "grass, solidago, alder, and the like." Munte (1902) on the other hand stated that this species did not attack *Solidago* but preferred *Impatiens* or *Eupatorium*. Yuncker (1919) described this species of dodder for Indiana and stated that it was often found growing on onions, tomatoes and occasionally on *Equisetum*. In the same paper this author expressed the belief that *C. Gronovii* would grow on any host within reach.

[1] Published with aid to Rhodora from the National Academy of Sciences.

Moss (1928), studying the haustorium of *C. Gronovii*, listed four host plants for this species, *viz. Monarda mollis* L., *Lathryus ochroleucus* Hook., *Artemisia gnaphalodes* Nutt. and *Symphoricarpos racemosus* Michx. Yuncker (1932) in a later monograph listed 31 genera of host plants for this species of dodder. Fourteen of this number of host genera were not observed by the present writer in West Virginia and are designated in the following list, as taken from Yuncker's later Monograph, by an asterisk (*). Concerning *C. Gronovii* Yuncker stated (1932), "this species shows no specialization of hosts but grows on a large number of different species of herbaceous and woody plants, e.g., *Rubus, Cephalanthus, Aster, Solidago, Dianthera, *Tecoma, Impatiens, Eupatorium, Polygonum, Salix, *Saururus, Hypericum, Desmodium, Rhus, *Vernonia, *Rudbeckia, *Pelargonium, Laportea, Lactuca, Phytolacca, Artemisia, *Solanum, *Allium, *Polypodium, *Urtica, *Chrysanthemum, *Mikania, Boehmeria, *Acalypha, *Jussiaea, *Mesosphaerum,* etc." The present writer's observations support the later belief of Engelmann and corroborate the statements of Yuncker.

Eighty-three species of host plants, all Angiosperms,[1] were listed by the writer for *C. Gronovii* during the summer of 1930. Of these plants 59 are herbaceous, three twiners, three woody vines, six shrubs, six trees, two sedges and four grasses. Twenty-nine families and sixty-eight genera are represented in this list.

A majority of the infested plants were found growing in low, moist, places under conditions similar to those present along creek and river banks, wet bottom-lands and various poorly drained areas. In the case of the trees and shrubs only the younger parts, or shoots, were attacked while both young and mature herbaceous plants were infested.

In conjunction with certain experiments at the State University of Iowa additional infestations were brought about. Host plants of *C. Gronovii* thus added to the 1930 list include *Helianthus annuus* L., *Fagopyrum esculentum* Moench., *Cucurbita maxima* Duchesne, *C. Pepo* L., *Cucumis sativus* L. and *C. Melo* L. These plants, grown and infested under greenhouse conditions, increase the total number of host plants observed by the writer for *C. Gronovii* to eighty-nine species.

[1] Species of *Cuscuta* have previously been reported, except for Yuncker's reference to Equisetum, as parasitizing Angiosperms only. Singh (1933), however, has succeeded in growing *C. reflexa* upon one fern, *Athyrium pectinatum* Wall.

ALPHABETICAL LIST OF HOST PLANTS OF CUSCUTA GRONOVII WILLD.[1]

Acer Negundo L.
A. saccharinum L.
Achillea Millefolium L.
Actinomeris alternifolia (L.) DC.
Agrimonia parviflora Ait.
Ambrosia trifida L.
A. artemisiifolia L.
Anemone virginiana L.
Apios tuberosa Moench.
Aster prenanthoides Muhl.
Betula nigra L.
B. lutea Michx. f.
Bidens bipinnata L.
Boehmeria cylindrica (L.) Sw.
Carex lurida var. gracilis (Boott) Bailey
Cephalanthus occidentalis L.
Chenopodium album L.
Chelone glabra L.
Cicuta maculata L.
Cimicifuga racemosa (L.) Nutt.
Clematis virginiana L.
Convolvulus sepium L.
Cryptotaenia canadensis (L.) DC.
Cucurbita maxima Duchesne.
Cucurbita Pepo L.
Cucumis sativus L.
C. Melo L.
Daucus Carota L.
Desmodium canescens (L.) DC.
Dianthera americana L.
Elymus virginicus L.
Epilobium adenocaulon Haussk.
Erigeron canadensis L.
E. annuus (L.) Pers.
Eupatorium perfoliatum L.
E. purpureum L.
E. urticaefolium Reichard.
Fagopyrum esculentum Moench.
Galinsoga parviflora var. hispida DC.
Galium Aparine L.
Glycine soja Sieb. & Zucc.
Helianthus annuus L.
Hydrangea arborescens L.
Impatiens pallida Nutt.
I. biflora Walt.
Ipomoea pandurata (L.) G. F. W. Mey.
Kalmia latifolia L.
Lactuca scariola L.
L. saligna L.
Laportea canadensis (L.) Gaud.
Medicago sativa L.
Melilotus alba Desr.
M. officinalis (L.) Lam.
Menispermum canadense L.
Monarda mollis L.
Oenothera biennis L.
Oxalis corniculata L.
Panicum clandestinum L.
Perilla frutescens (L.) Britton
Phytolacca decandra L.
Phleum pratense L.
Plantago Rugelii Dcne.
P. lanceolata L.
Polygonum sagittatum L.
P. Hydropiper L.
Poa pratensis L.
Prunella vulgaris L.
Ranunculus recurvatus Poir.
Rhus Toxicodendron L.
Rosa carolina L.
Rubus canadensis L.
Rumex obtusifolius L.
R. crispus L.
Sambucus canadensis L.
S. racemosa L.
Salix nigra Marsh.
S. sericea Marsh.
Scirpus americanus Pers.
Sida spinosa L.
Solidago rugosa Mill.
S. sp.
Stachys tenuifolia var. aspera (Michx.) Fernald.
Ulmus fulva Michx.
Verbesina occidentalis Walt.
Viola papilionacea Pursh.
Vitis cordifolia Michx.
Trifolium pratense L.
Teucrium canadense L.
Xanthium canadense Mill.

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[1] Nomenclature following Gray's Manual of Botany (7th edition) in most instances

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University of Iowa

Recent Additions to the Flora of St. Louis County, Missouri. —Although St. Louis county is as well known botanically as any other county in Missouri, species new to its flora are being found each year as a result of more careful search along railroad rights-of-way, ballast and other waste ground, and sand-bars and mud flats along the Mississippi and Missouri Rivers. In the summer of 1931 *Picris Sprengeriana* Poir. was collected for the first time in Missouri along railroad tracks in St. Louis Co. During the summer and autumn of 1933 the writer found several species in St. Louis Co. which proved to be new additions to the flora of that county. These additions are *Nicotiana longiflora* Cav. and *Datura Metel* L. from ballast ground near the Mississippi River in South St. Louis; *Solanum Torreyi* Gray and *Croton Engelmanni* Ferg. along railroad tracks in St. Louis; *Solidago rugosa* Mill. in low woods along the Mississippi River north of Chain-of-Rocks; *Rubus trivialis* Michx.[1] from low alluvial woods along the Meramec River near its confluence with the Mississippi; and *Tamarix gallica* L. and *Corispermum hyssopifolium* L. from sand-dunes on an island at the junction of the Missouri and Mississippi Rivers. The last two species are interesting discoveries. The former had been known only from along the sand-bars in Jackson Co., extreme western Missouri, where it had been first reported for the state in 1932. Only two small plants of *Tamarix* were found on the island, the seeds probably having but recently been transported from further west along the Missouri River. The latter, *Corispermum hyssopifolium*, had been known previously in Missouri from only two western counties, namely, Jackson and Clay. This species was growing profusely on the sand-dunes which covered this island, and together with *Cycloloma atriplicifolium* (Spreng.) Coult., comprised the dominant vegetation. Other ammophilous species, such as *Sporobolus cryptandrus* (Torr.) Gray and *Triplasis purpurea* (Walt.) Chapm., occurred on the xerophytic dunes of the island. The occur-

[1] Also *Smilax Bona-nox* L.

rence of such western species as *Corispermum hyssopifolium* and *Cycloloma atriplicifolium* as far east as the Mississippi River is an interesting fact, both species being known as far east as the Great Lakes area.

Other collections made by the writer in St. Louis Co. during the season of 1933 which are rare but not new to the county include *Kochia scoparia* (L.) Schrad., *Chenopodium Botrys* L., *Leersia lenticularis* Michx., *Vitis palmata* Vahl., *Quercus lyrata* Walt., *Cynodon Dactylon* (L.) Pers., *Ipomoea coccinea* L., *Parosela leporina* (Ait.) Rydb. var. *alba* (Michx.) Macbride, and *Acnida tuberculata* Moq. var. *subnuda* Wats.—Julian A. Steyermark, Missouri Botanical Garden, St. Louis, Mo.

Antennaria plantaginifolia with Rosy Involucres.—A small patch of staminate plants of *Antennaria plantaginifolia* (L.) Richards. with rosy-pink involucres was found May 2, 1934 on a dry hill of glacial drift in the meadows at East Lexington, Massachusetts. These plants were surrounded by many other staminate and pistillate plants, all with white involucres. On May 11, the infloresences had become loose and the involucres had faded so that they were just noticeably pink. According to Professor Fernald the European plant, *Antennaria dioica* (L.) Gaert., has rosy involucres just as often as white or straw-colored ones; he has not previously seen pink involucres in our plant.—Ruth Peabody, Radcliffe College.

Trillium grandiflorum in New Hampshire.—"*Trillium grandiflorum*, new to New Hampshire" was the enthusiastic comment of Prof. Fernald as he and the members of the Radcliffe Botany 10 field-excursion stood in a colony of these plants which had caught my eye as we passed the locality in the automobile. The Trilliums were growing in a perfectly natural setting with *Veratrum viride* and *Osmunda cinnamomea*, forming an association in open mixed woods. This colony in the western part of the township of Bethlehem, New Hampshire, is the first known for the species in the state. Except for two stations in eastern Vermont, one in Thetford the other in Woodstock, mentioned by Jesup in his "Flora and Fauna within thirty miles of Hanover, New Hampshire," 1891, and a colony in Chesterville, Maine, it is the only one known east of the Green Mountains.—A. R. Hodgdon, Harvard University.

Volume 36, no. 429, including pages 309–348 and plates 299–313, was issued 8 September, 1934.

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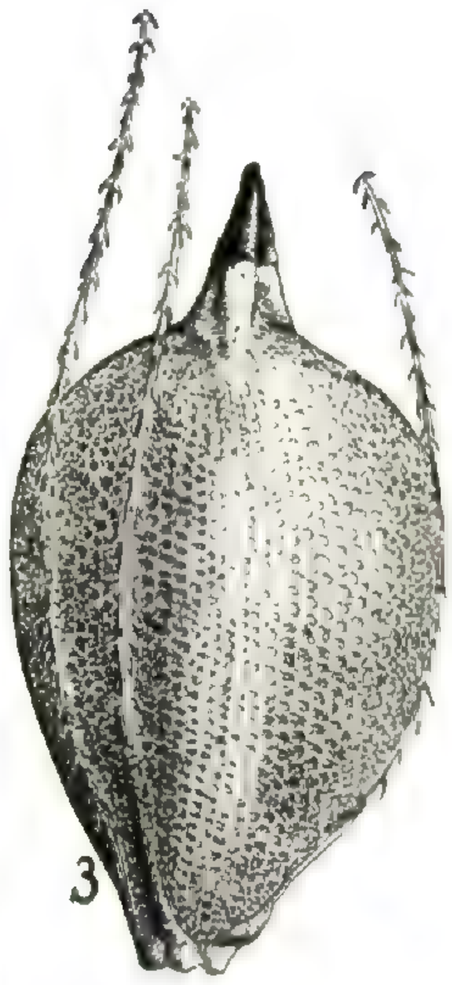

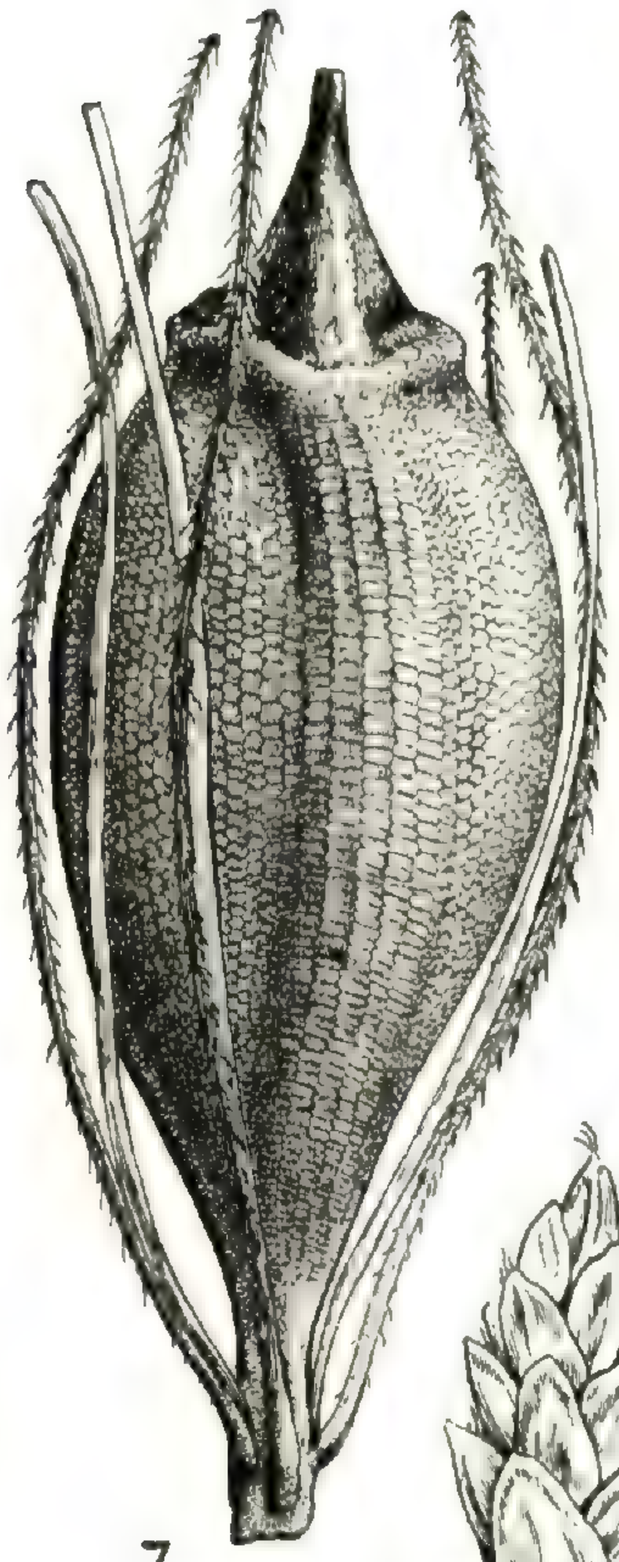

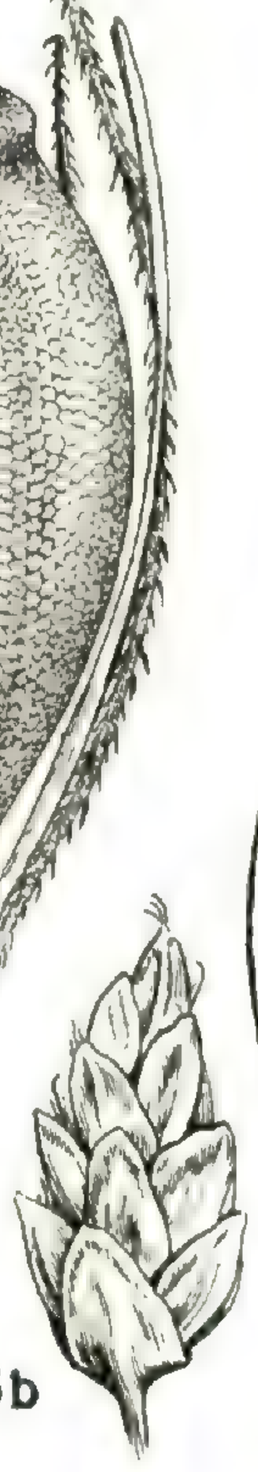

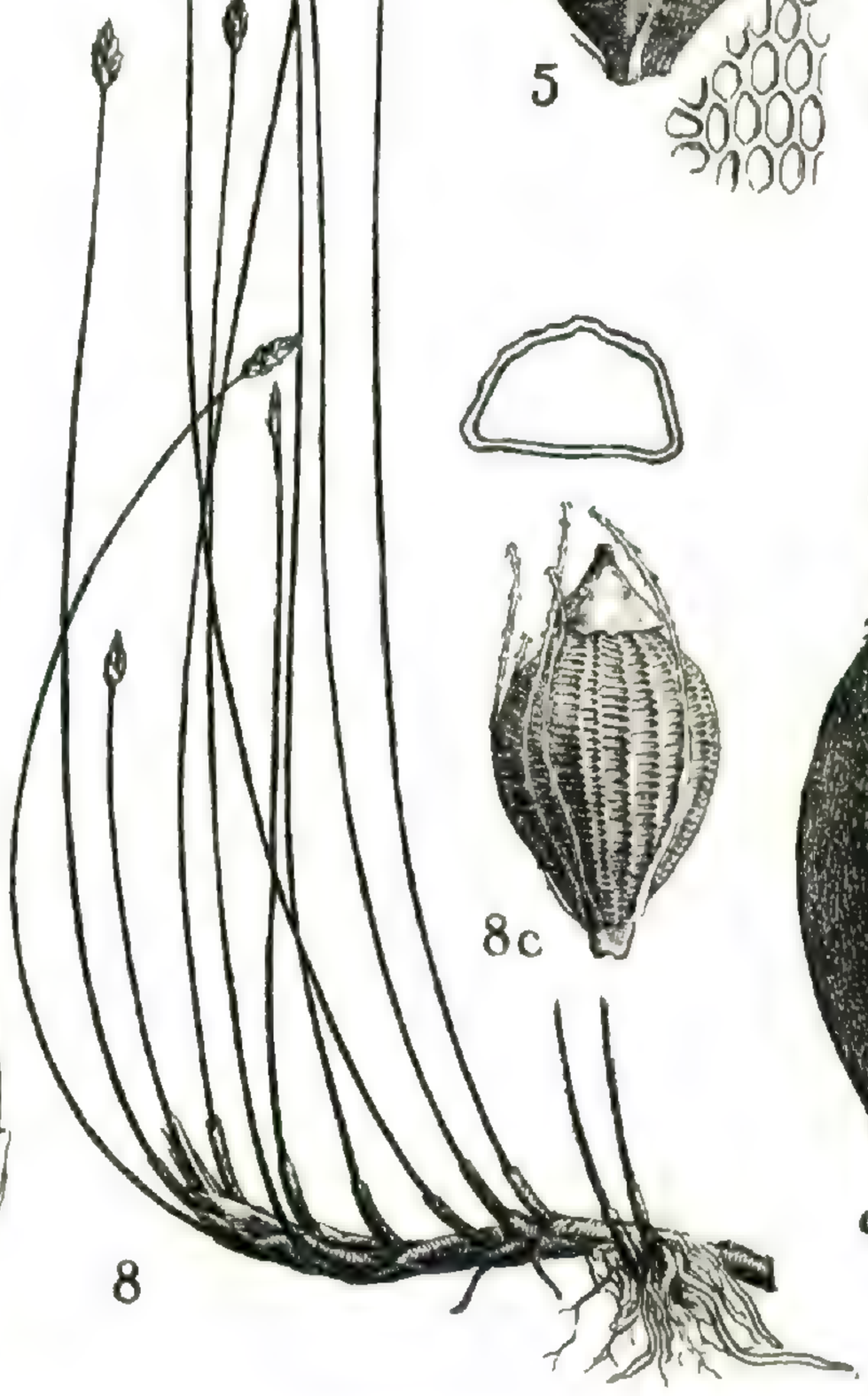

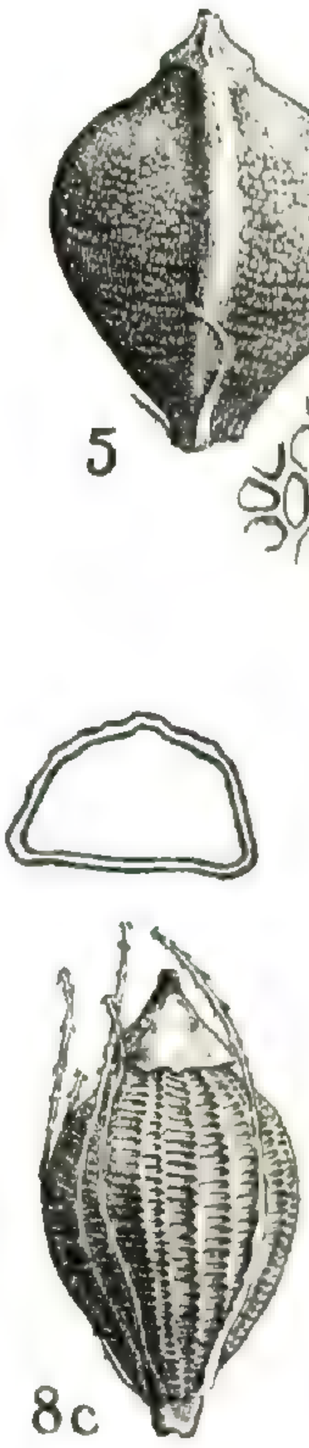

ELEOCHARIS (achenes, × 20). E. PAUCIFLORA: FIG. 1, from Scotland; FIG. 2, from Maine (var. FERNALDII); FIG. 3, from California (var. BERNARDINA); FIG. 4, from Chile.
E. PARVULA: FIG. 6, from New York; FIG. 5, from Louisiana (var. ANACHAETA).
E. MARGARITACEA: FIG. 7, from Kamtchatka.
E. SQUAMIGERA: FIG. 8, from Brasil (habit, × ½).
E. ROSTELLATA: FIG. 9, from New York. The details of surface markings are placed at right of the achenes.

RHODORA

JOURNAL OF

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Vol. 36. November, 1934. No. 431.

MONOGRAPHIC STUDIES IN ELEOCHARIS. III.[1]

H. K. SVENSON

Plates 320 and 321

1. THE EASTERN AMERICAN SEGREGATE OF ELEOCHARIS PAUCIFLORA

ELEOCHARIS PAUCIFLORA (Lightf.) Link from eastern America has a slender appearance compared with specimens from Europe. The fact was apparent to me in my previous treatment[2] of the species, but it seemed best to withhold further subdivision until material could be studied more closely. Shortly after a visit to the highlands of Scotland,[3] Professor Fernald wrote me describing the different appearance of *Eleocharis pauciflora* in its type region (Scotland) as compared with the plant from eastern United States to Newfoundland, calling my attention especially to differences in size of the spikelet and the size and shape of the achene. These differences I find in general are well sustained.

Even within identical geographic areas the achenes are greatly variable in mass, prominence of reticulation, degree of acuteness of the outer angle (plano-convex or even biconvex achenes will occasionally be encountered) and the clear-cut or obscure character of the tubercle. Being an attractive species, *E. pauciflora* is often collected in the flowering stage, and due also to the small number and variability of the achenes, tabulation of data is often both difficult and unsatisfactory. Material from the Himalayas and Andes is especially

[1] Brooklyn Botanic Garden Contributions, No. 68.

[2] RHODORA xxxi. 171 (1929).

[3] M. L. Fernald, Some Rare Plants of Scotland. Journ. Bot. lxix. 8–10. (1931).

meagre. Whatever success I may have in portraying the variation of *E. pauciflora* and related species is due largely to the photographs made by Mr. Louis Buhle and the painstaking drawings by Miss Maud H. Purdy, both of the Brooklyn Botanic Garden. Professor Fernald has been kind enough to send me for comparison a large collection of *Eleocharis pauciflora* from the Gray Herbarium, and I have borrowed much additional material through the courtesy of the curators of herbaria of the United States National Museum, the New York Botanical Garden, the California Academy of Sciences, the University of Wisconsin, and the New York State Museum; and through the kindness of the curators of the Herbarium of the Royal Botanic Gardens at Kew I have examined the rich collection of *Eleocharis* and the unfinished manuscript left by the late C. B. Clarke. Mr. J. William Thompson of Washington has also sent me excellent material from his herbarium.

As previously stated, one of the characteristic differences between the European and Eastern American plant is the size of achenes. Since it is difficult to accurately measure individual achenes to the tenth of a millimeter, a more satisfactory result is obtained by taking the total dimensions of four achenes placed end to end and side by side on a millimeter rule. Division of the total by four gives a good average size of individual achenes, as shown in the following table:

	EUROPE	
F. Schultz 1156	Germany	2.6 x 1.2 mm.
Fernald 2329	Scotland	2.5 x 1.3 mm.
Bordère	Hautes-Pyrénées	2.3 x 1.1 mm.
Rasmussen	Denmark	2.5 x 1.3 mm.
Kneucker 139	Switzerland	2.3 x 1.1 mm.
P. de la Bathie	France	2.6 x 1.2 mm.
	WESTERN NORTH AMERICA	
Patterson	Colorado	2.0 x 1.2 mm.
Mackenzie 186	Colorado	2.3 x 1.2 mm.
Nelson 6159	Wyoming	2.3 x 1.2 mm.
Rydberg 3811	Idaho	2.3 x 1.1 mm.
Macoun	Saskatchewan	2.0 x 1.1 mm.
Munz 10683	California	2.3 x 1.2 mm.
Peck 15438	Oregon	2.4 x 1.1 mm.
	SOUTH AMERICA	
Werdermann 1297	Chile	2.3 x 1.1 mm.
Johnston 4711	Chile	2.3 x 1.3 mm.
	EASTERN NORTH AMERICA	
Gray Exsic. 3	Maine	2.5 x 1.1 mm.
Fernald 12822	Maine	2.5 x 1.0 mm.

	EASTERN NORTH AMERICA—*Continued*	
Fernald 246	Maine[1]	1.9 x 0.9 mm.
Macoun 34565	Ontario	2.5 x 1.1 mm.
Deam 36640A	Indiana	2.5 x 1.1 mm.
Vasey	Illinois	2.4 x 1.0 mm.
	ASIA	
Griffith	Afghanistan	2.2 x 1.2 mm.
	VAR. SUKSDORFIANA	
Suksdorf 2237	Washington	2.8 x 1.4 mm.
Suksdorf 2820	Washington	2.8 x 1.1 mm.
A. S. Hitchcock	Arizona	2.6 x 1.3 mm.
	VAR. BERNARDINA	
Munz 10804	California	2.1 x 1.2 mm.
Hall 7608	California	2.0 x 1.1 mm.

Professor Fernald's collection (wet peaty slope at Kinlochewe, Rosshire, Scotland, *Fernald, Pease & Long* 2329) is robust, more so than any other European material which I have seen, with rigid culms 20–25 cm. high and spikelets 6–8 mm. long,[2] and with approximately six flowers in a spikelet (see PL. 321, FIG. 1). In conformity with practically all European specimens the hardened caudices contrast with the generally soft material from eastern America in which (at least in herbarium specimens) the weak rootstocks appear scarcely thicker than the culms. Notably in some specimens from western Newfoundland (*Fernald, Long & Fogg* no. 1338 from "peaty and marly borders of shallow ponds in limestone barrens, Pointe Riche" and *Fernald, Wiegand & Long* no. 27524 from the Straits of Belle Isle) and occasionally in other collections from the northern limit of the range the caudices are hardened, in this respect approaching the plants of Europe and western United States. I have seen *E. pauciflora* only as scattered individuals in wet concentrated marl, but according to Professor Fernald's observations, a sort of turf is often formed. This turf apparently does not become as dense as in *Scirpus cespitosus* with which *Scirpus pauciflorus* was confused in early times, a condition which is of some significance in the discussion of *Eleocharis Vierhapperi* to follow. Withering[3] at an early date observed that "The *S. pauciflorus* is very different in its habit from the *caespitosus*, for besides its growing single and not *cespitose*, the

[1] Dwarf plants 6–9 cm. high.

[2] Hegi, Ill. Fl. Mittel-Eur. ii. 40 (1909), describes the spikelets of *E. pauciflora* as 4–8 mm. long, and 3–7 flowered.

[3] Arrangement of British Plants, ed. 6, ii. 112 (1818).

stems generally decline and scatter from each other, instead of being upright and close together."

The plant of Europe has in general a more prosperous appearance than the eastern American plant. The spikelets have a fuller aspect, and the achenes themselves are larger and more sharply angled. These characteristics together with the glistening surface and the strong regular development of bristle-teeth appear to be constant. The comparison may be summed up in tabular form:

E. PAUCIFLORA of Europe.	E. PAUCIFLORA of Eastern America.
Plants rigid, the caudices indurated.	Plants soft, with scarcely indurated caudices.
Spikelets 5–8 mm. long, averaging 6 flowers.	Spikelets a little narrower, 4–6 mm. long, averaging 5 flowers.
Achene equilaterally triangular, usually shiny.	Achene with abaxial angle usually somewhat broader, the achene usually dull and narrower than in the European plant.
Bristles with regular sharp retrorse teeth.	Teeth of bristles usually weak and irregular.

There is too much variation in surface markings and color of achenes for these characteristics to be of diagnostic value; the reticulation often varies greatly in different parts of the same achene, as may be seen in Miss Purdy's drawings. The surface is sometimes smooth, at other times with a depression in the central portion of each minute polygon. Longitudinal ribbing frequently occurs.

ELEOCHARIS PAUCIFLORA var. **Fernaldii**, n. var. PL. 320, FIG. 2; PL. 321, FIGS. 2, 5; also RHODORA XXXI. PL. 189, FIG. 23 (1929). A planta europaea recedit caudice non rigido, achaeniis angustioribus et minus angulatis, setarum barbis pusillis.—Western Ontario to Newfoundland, south to Iowa, Illinois, Indiana, northwestern Pennsylvania, central New York, and northern New England. The TYPE, *Fernald & Long* 12822 (in Gray Herb.) is from a marly bog, Monticello, Maine. Geographically interesting stations in addition to records in my previous paper are QUEBEC: Brushy Island, east coast of James Bay, *D. Potter* 791 (G); Mingan, *H. F. Lewis*, Canadian Field Nat. xlv. 201 (1931); Wolf Bay (50° 16′ N, 60° 18′ W) and Bradore Bay (51° 28′ N, 57° 14′ W) *H. F. Lewis* in 1927 (Albany); Oka, *Victorin* 738 (G). VERMONT: Lyndon, *Congdon* in 1873 (B). ONTARIO: Manitoulin Island, Lake Huron, *Fassett* in RHODORA XXXV. 388 (1933). INDIANA: Hammond, Lake County, *Deam* 53939 (B). MICHIGAN: Cheboygan County, *F. C. Gates* nos. 9417, 9465, 9818 (B). IOWA: Estherville, *B. O. Walden* in 1931 (G).[1]

[1] To these records should be added: MAINE: Labrador Pond, East Sumner, *Gager & Svenson*, no. 6338. ONTARIO: Great Cloche Island, Manitoulin Distr., *Fernald & Pease*, no. 3146. MICHIGAN: Manistique, *Fernald & Pease*, no. 3147.

Dr. H. D. House of the New York State Museum at Albany has written me that *Eleocharis pauciflora* is not known in New York State east of Litchfield, Herkimer County, and that reports from the Adirondack region are probably based on specimens of *Scirpus cespitosus*.

The problem in western North America[1] is more difficult. The plants have thickened caudices and the achenes are closer in size (see table) and prominence of angles to those in Europe. The bristles, however, are more slender, resembling those of eastern American plants. Some of the western specimens are identical in appearance with the European, for example, *Nelson* 6159 from Yellowstone Park compared with *Petrak* 722, Fl. Bohemiae et Moraviae Exsic. I am inclined to believe that there is a series of intergrading variations between the gigantic var. *Suksdorfiana*, with its center of distribution apparently in the mountains of Washington and Oregon, to the depauperate material from southern California described as *Scirpus bernardinus*.[2] Of these two extremes the var. *Suksdorfiana*, at first confused with *Eleocharis rostellata*, is the more striking, with large spikelets often 1 cm. long and achenes approaching 3 mm. in length. Additions to collections of var. *Suksdorfiana* previously cited by me are WASHINGTON: near Egbert Spring, Douglas County, *Sandberg & Leiberg* 416 (B), culms reaching 35 cm. in height. OREGON: Mt. Hood, *Applegate* 2842 (U.S), with rigid culms 25–30 cm. high, similar to the type collection. COLORADO: Cassells, Park County, *Cathcart* in 1904 (U.S.), in flowering stage, culms broad, 30 cm. high, anthers 2–3 mm. long. ARIZONA: Flagstaff, *A. S. Hitchcock* in 1916 (U.S.). The last named collection has culms 5 dm. high and the largest subterranean buds measure approximately 1 x 0.5 cm. These buds or tubers appear to contain large quantities of starchy material, and in addition to being of value as food for aquatic birds (see RHODORA xxxi. 174 (1929), footnote), it is possible that selected stocks might produce a crop worth growing in boggy mountain meadows. The great economic value in the Orient of the "water chestnut" (*Eleocharis dulcis*) may be mentioned in this connection.

There is not yet sufficient understanding of *Eleocharis atacamensis* Philippi of the desert regions of Chile. This species Clarke reduced,

[1] The northernmost material seen is from NORTHWEST TERRITORIES: shore of Keith Island, Great Slave Lake, *Raup* 374 (G).

[2] On the basis of material examined, I think *Scirpus bernardinus* should be considered merely as an aberrant form of *Eleocharis pauciflora*. Its status as a variety is questionable.

with sufficient reason it seems to me, to the widespread and variable *Eleocharis pauciflora*. Barros[1] treats *E. atacamensis* as distinct, pointing out that in contrast to North American specimens of *E. pauciflora*, the 3–5 bristles are fewer, shorter than the achenes, thicker, and of a cinnamon color instead of white, and that the culms are arched. He also notes that the basal scale is sterile, whereas the plant of North America has the lowest scale fertile. Especially important is the heavy reticulation of the base of the style in undeveloped achenes (see fig. 31, l. c.) which Barros (and I am in perfect agreement with him) considers to be a distinctive characteristic of the genus *Eleocharis* as distinguished from *Scirpus*. This heavy reticulation is present to some extent in all species of the series *Pauciflorae* (cf. PL. 320), even in mature achenes. His figures of *Eleocharis atacamensis* leave no doubt in my mind that he is dealing with the same species that I have before me (represented by *Johnston* 4711 and *Werdermann* 1297). Philippi's description (quoted by Barros) calls for cespitose plants 3–3½ inches (8–9 cm.) tall and similar dwarf plants are figured by Barros. The abundant collection by Johnston contains dwarf spreading plants only 6 cm. high, (cf. PL. 320 FIG. 9) and tall erect ones reaching 25 cm., with many intermediates. Werdermann's plants (no. 1297) are 25–30 cm. tall; a representative of his no. 966 at Kew (Atacama, Chile 3600 m.) has a much thickened base and culms 22 cm. tall. In comparing these plants with specimens from North America and Europe, I am in agreement with Barros that the lowest scale is sterile (cf. *E. Vierhapperi*), a rare situation in *E. pauciflora*. The bristles are occasionally six. Their size does not differ appreciably from European material, but they do tend to be a trifle more reddish than in the general run of specimens. The style-base (tubercle) is generally less prominent and darker than in the North American and European specimens, but a whitened proximal area is sometimes well developed.[2] All things considered, this *Eleo-*

[1] Anales Mus. Hist. Nat. Buenos Aires xxxiv. 486–488, fig. 31 (1928).

[2] The style-base (tubercle) of *E. pauciflora* (cf. PL. 320) is made up of two parts. The lower is an upright column frequently of more spongy texture than the body of the achene. It is also usually differentiated by three grooves which form roughly an equilateral triangle in a plane at right angles to the long axis of the achene. The upper part consists of a dark fragment of the style itself. In the Andean material of *E. pauciflora* the spongy lower part of the tubercle is often reduced, sometimes nearly obliterated, and tends in general to be darker than in European specimens. A collection recently received from Argentina: Prov. Jujuy, 2500 m. *Venturi* 9650 (U. S., B), shows no difference from typical *E. pauciflora* except a darkening of the spongy lower portion of the tubercle and slightly darker bristles.

The upper portion of the tubercle is probably homologous with the entire tubercle

charis is so close to *E. pauciflora* that it may well be included within that species.

E. melanomphala C. B. Clarke, Engl. Bot. Jahrb. xxx. Beibl. 68: 24 (1901) was based upon a Chilean collection, *O. Kuntze* no. 30, Paso Cruz, 34° S, alt. 2100 m. The type specimen which I examined at Kew differs from *E. pauciflora* only in the plumper and smoother achene (2 mm. long), with its shorter tubercle. Reticulation characteristic of *E. pauciflora* is found on the achene, especially near the base.

The recently described *E. Vierhapperi* Bojko[1] from the South Tyrol Dolomites is said to differ from *E. pauciflora* in dwarfness (culms only 3–6 cm. high), in scattered (not cespitose) growth, in a thicker style which is not deciduous and which has 2 (occasionally 3) branches, in having 4 (or less) bristles, and the lowest scale of the spikelet *sterile* (in 27 out of 42 spikelets examined). The plants grew in strongly alkaline soil which had a concentration of 45% CaO and pH 7.8. Since lenticular achenes are occasionally found in *E. pauciflora*[2] it is therefore not surprising, though of great interest, to find a collection with transition from three to two style-branches. Persistence of the entire style in mature achenes of typical *E. pauciflora* is not uncommon. Both *E. pauciflora* and *E. Vierhapperi* are well illustrated and compared by Bojko, but I feel that *E. Vierhapperi* is a depauperate form of *E. pauciflora*, lying well within the limits of that species. The stolons as illustrated do not appear different from those of some other European collections, for example Flora Rhaetica Exsic. no. 414.

I have seen specimens of *E. pauciflora* from eastern Europe and Asia only as follows: GREECE: Pindus Tymphaeus, 4500–5000 ft., serpentine, *Haussknecht* in 1885 (Kew). AFGHANISTAN: *Griffith* (N. Y.). KASHMIR: Gurais Valley, *Winterbottom* 551 (Kew); Rangdum, 13000 ft., w. of Lara, Peti Valley, *Ormaston* 265 (Kew). TIBET occ.: 15000–16000 ft., *Thomson* (Kew, G). The eastern, often indefinite, localities mentioned by Hultén (Fl. Kamt. i. 169 (1927)) I have represented by crosses in the accompanying map (MAP 1). He gives the range of *E. pauciflora* as Iceland, northern Scandinavia,

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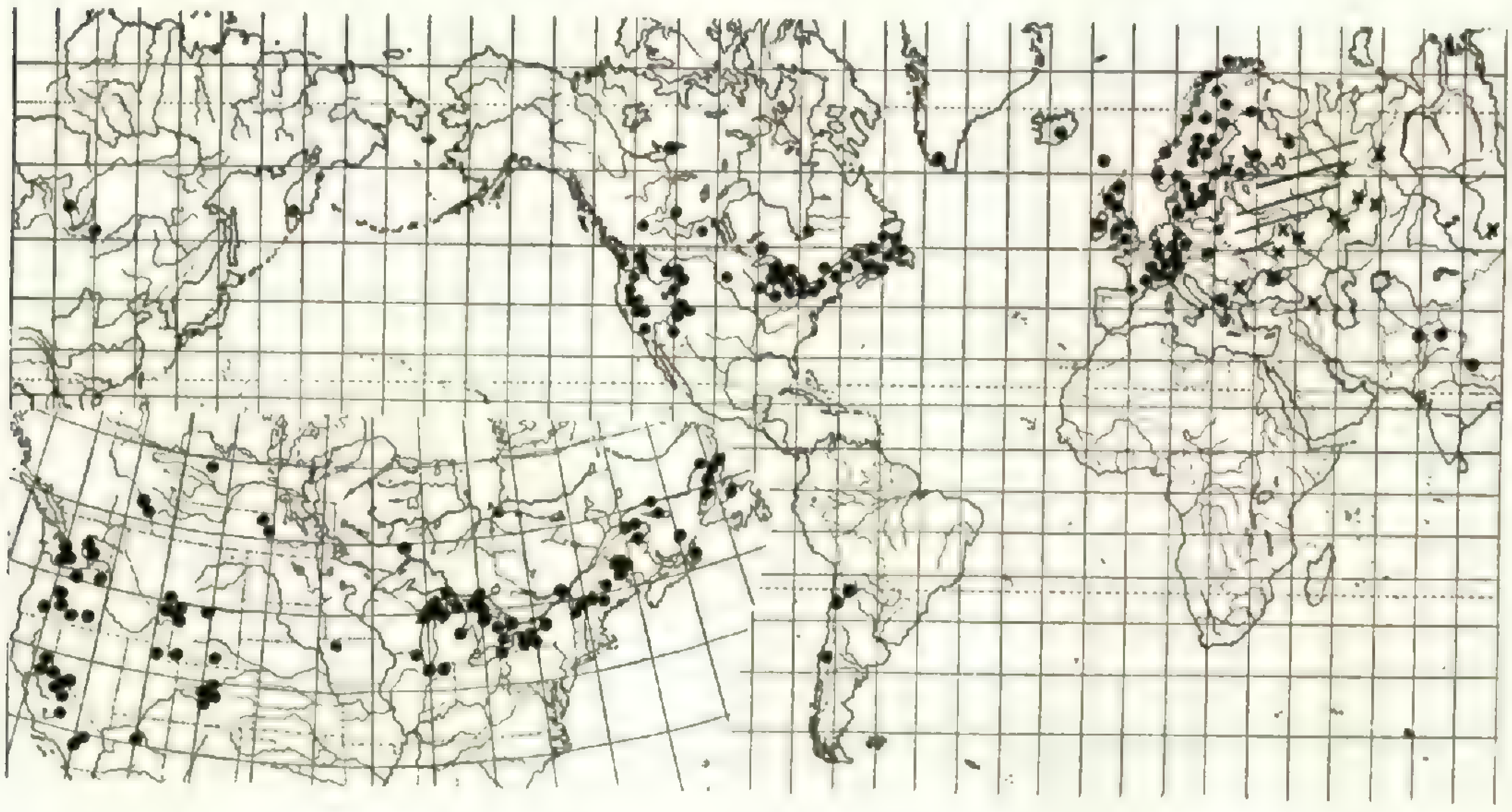
in such specialized types of *Eleocharis* as *E. palustris*. The situation in *E. pauciflora*, i. e. a spongy column tipped by a fragment of the style, is analogous to structures in several species of the *Mutatae*, notably *E. cellulosa*, *E. mutata* and *E. plicarhachis*.

[1] Verh. Zool.-Bot. Ges. Wien lxxix. 300, 10 figs. (1930).

[2] I have noticed them very sparingly in *Fl. Hungarica Exsic.* no. 177 (some of the styles appear bifid) and *Munz* no. 10804 (California).

Vologda and Urals (62° N. lat.) south to central France, Italy, Bulgaria, Crimea, Poltava and Kursk; also in Spain. Scattered localities occur in other parts of Russia and in Transcaucasia. ASIA: some few localities in Tomsk prov., Irkutsk prov., Transbaikalia, and Kamtchatka, also in N. E. Asia Minor [perhaps represented by



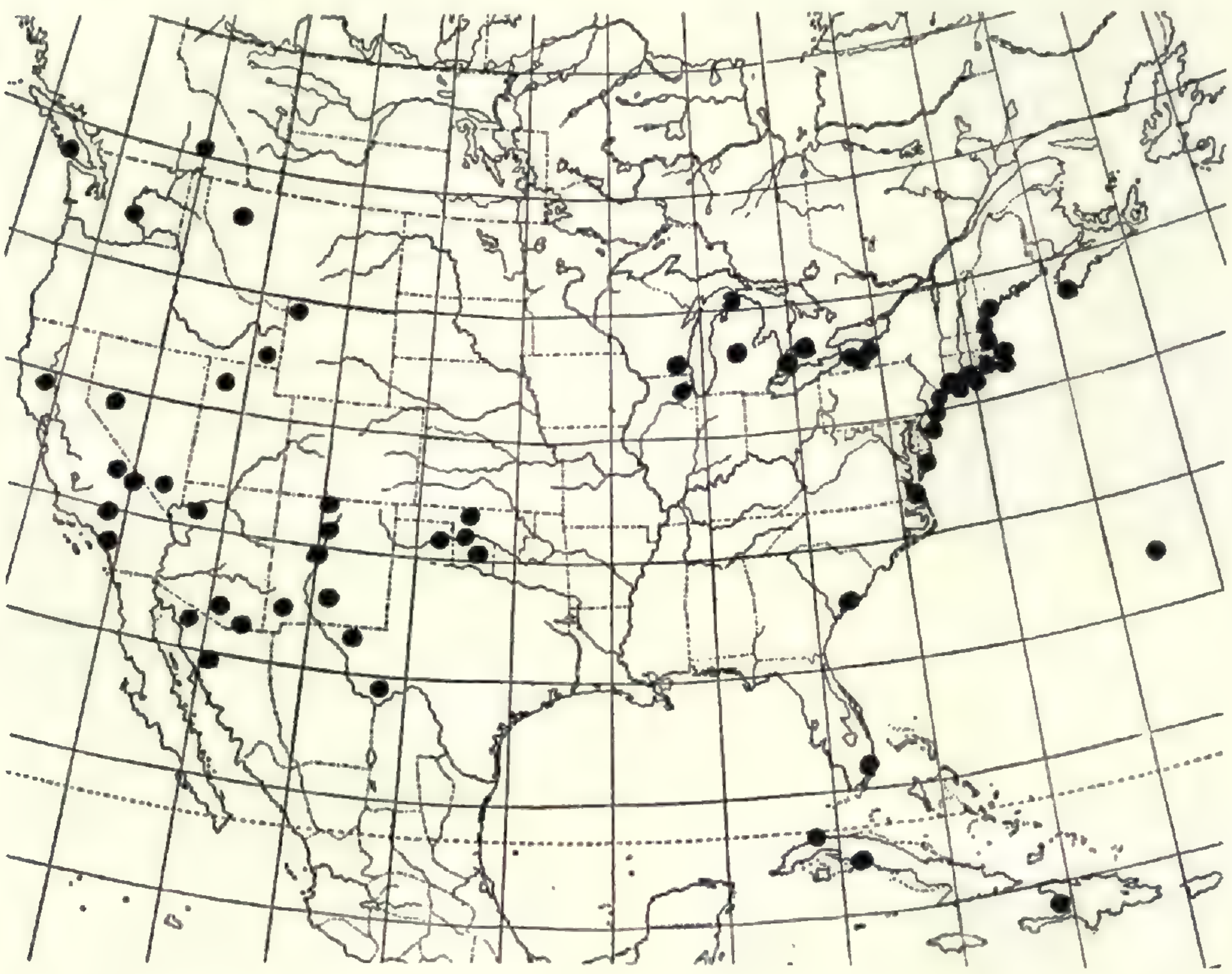
Map 1. Range of ELEOCHARIS PAUCIFLORA; insert, North American Range.

E. macrantha], and (?) Kashmir, Pamir and Tibet. Fedtchenko (Rastitel nost Turkestana 161 (1915)) cites it from the Sungarian Altai, Tian Shan, and Pamir. The stations on the map from Scandinavia, Finland and Western Russia are largely compiled from Blomgren in Holmberg, Skand. Fl. 311 (1926). The plant is common in Norway north to Magerø (71° 7′ N) according to Blytt, Norges Fl. ed Dahl, 175 (1906).[1]

In a collection of *Eleocharis* from the U. S. National Herbarium, I was surprised to find good specimens of the closely related *E. rostellata* represented by *Venturi* nos. 6193 and 6194 from prov. Tucuman, Argentina, at altitudes of 2650 m. and 1650 m. respectively. These are the first records from South America. *E. platypus* C. B. Clarke, Engl. Bot. Jahrb. xxxiv, Beibl. 78. 3 (1904) is *E. rostellata*. The Spruce collection at Kew labeled "Andes Quitenses prope Guano

[1] In response to my inquiry as to the status of *E. pauciflora* in Greenland, Dr. Morten P. Porsild has written that, although the species is common in Iceland, it is one of the rarest plants in Greenland and is known at present from only four stations: Neria, 61° 33′, *J. Eugenius;* Igaliko, 61° 2′, *Rosenvinge;* Qagssiarssuk, 60° 53′, *A. E. & M. P. Porsild;* Unartoq, 60° 30′, *N. Hartz.*

1859" is the basis of Clarke's description. It consists of a plant with thickened rootstocks, long recurving culms, and achenes 2 mm. long, identical with those of *E. rostellata*. The presence of this species



Map 2. North American Range of ELEOCHARSI ROSTELLATA.

in the Andes further accentuates western South America as the center of distribution of the series *Pauciflorae*.[1] The accompanying map (MAP. 2) gives, with the exception of the South American specimens, the known distribution of *E. rostellata*.[2]

In the illustrations of this group (PL. 320), I have selected material which shows the triangular and concave-sided character of the tubercle, which is probably the primitive condition. Immersion of these species (*E. rostellata*, *E. pauciflora*, and *E. parvula*) in an alkaline

[1] *E. simulans* C. B. Clarke (see RHODORA xxxi. 181 (1929)) is according to Clarke's manuscript at Kew "only an extreme state of *E. melanostachys* d'Urville" which is *E. macrorhiza* Boeckl., a species of the *Palustres* described from the Falkland Is. This classification agrees with the 2-parted style shown in the figure of *E. simulans* Clarke, Ill. Cyp. t. xxxvi (1909).

[2] Plants from the station in northern Michigan representing undistributed material from Wycamp Lake, Emmett County, *H. A. Gleason*, July 29, 1933, have culms up to 14.5 dm. long.

environment may possibly account for the indurated character of the tubercle which is so commonly seen.

Within the series *Pauciflorae* has appeared an additional, most unexpected species, which was published by Hultén as *Scirpus* (*Heleocharis*) *margaritaceus*. A specimen from the single known collection has been kindly given to me by Dr. Samuelsson. In order to conform with my treatment of *Eleocharis* I have written an emended description:

ELEOCHARIS **margaritacea** (Hultén), n. comb. PL. 320, FIG. 7. Subcespitose; culms glistening, 25–45 cm. high, sulcate, from a long gray caudex; apex of upper sheath blunt to slightly acute: spikelets about 1 cm. long, resembling those of *E. pauciflora*, the two lowest scales of the spikelet sterile, the lowest scale encircling the base of the spikelet, broadly ovate, deep brown below becoming yellowish-brown in older specimens, hyaline in the uppermost portion; the upper scales ovate, 1-nerved, obtuse or somewhat acute, costate, almost wholly scarious, with lacerate yellowish-brown margins in the older specimens: style 3-fid: stamens 3, with elongated flat whitened filaments: achene, including style-base, about 4 mm. long, glistening white with a cellular structure as in *E. pauciflora* but less prominent, the base much elongated, the apex surrounded by a turgid ring; style-base dark brown, conic-acute, approximately ½ to ⅔ mm. long, bristles brown, usually 6, retrorsely toothed, exceeding the achene.—*Scirpus* (*Eleocharis*) *margaritaceus* Hultén, Fl. Kamtchatka i. 167 fig. 12 (1927).[1] Known only from the type locality, between Petropavlovsk and Avatcha volcano, 250 m. alt. *Hultén* no. 1083. TYPE in Mus. Nat. Hist., Stockholm.

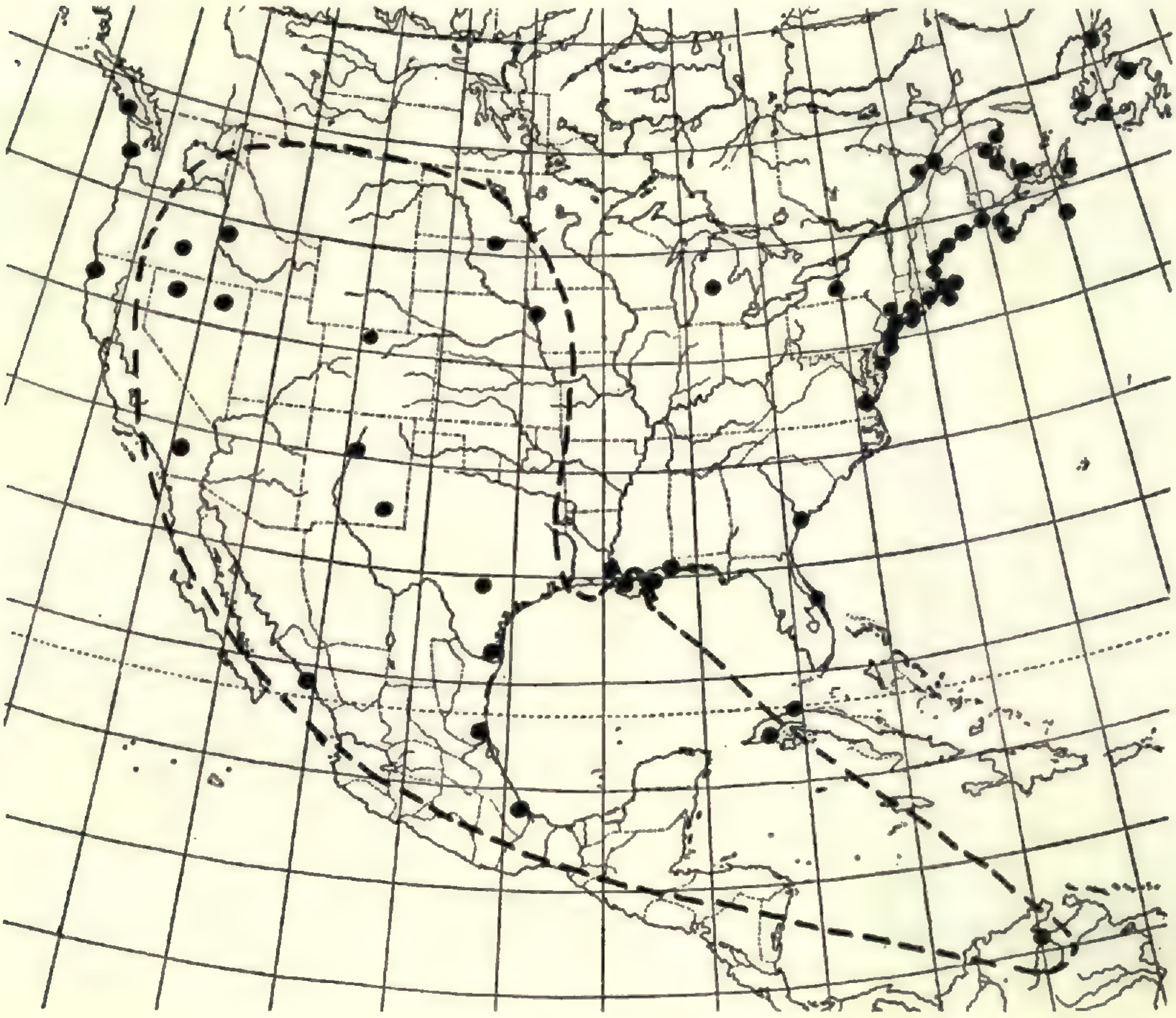
The shining white achenes, as Hultén notes, make the plant easily recognizable. Its relationship is unquestionably with *E. pauciflora* and the formation of a tumid ring at the base of the tubercle is curiously enough paralleled by a similar development in *E. albibracteata* and *E. boliviana* of the Andes. A character which is not shown by any other known species of *Eleocharis* is the long basal portion of the achene. This extended axis provides an unusual opportunity for examining the points of attachment of stamens and bristles. Careful dissection showed three stamens occupying the angles of the achene, inserted alternately with, and at the same level as three of the bristles. An additional set of three bristles occurred on a level of 0.4 mm. below, occupying positions corresponding to the achene angles, consequently directly opposite the stamens.

ELEOCHARIS PARVULA (R. & S.) Link var. **anachaeta** (Torr.)

[1] Kungl. Sv. Vet. Akad. Handlinger. ser. 3, Bd. 5, no. 1.

n. comb.—*E. pygmaea* Torr. var. β? *anachaeta* Torr. Ann. Lyc. N. Y. iii. 441 (1836). *Chaetocyperus* (*Elaeocharis*) *membranaceus* Buckley, Proc. Acad. Sci. Philadelphia 1862 10 (1862). ?*Isolepis leptos* Steud. Cyp. 91 (1855). *Scirpus nanus* var. *anachaetus* Britton, Trans. N. Y. Acad. Sci. xi. 75 (1892). *Scirpus coloradoensis* Britton, Torreya iv. 93 (1904). *Eleocharis leptos* Svenson, including vars. *coloradoensis* and *Johnstonii*, RHODORA xxxi. 176 (1929); not *E. lepta* C. B. Clarke in Dyer, Fl. Capensis vii. 758 (1900).

In my previous treatment I considered the slightly verrucose to papillose character of the achene surface, exhibited in its extreme form in the plants described by Britton as *Scirpus coloradoensis*, as



Map 3. North American Range of ELEOCHARIS PARVULA; var. ANACHAETA in ellipse.

a sufficient character in conjunction with reduction of bristles to separate the plant of southwestern United States from the common salt-marsh plant of the northern states. Examination of a larger amount of material than was available at that time has led me to

ally the plants more closely, and in treating the southern plant as a variety I am following the opinions of both Torrey and Kükenthal. Sharply angled achenes are not uncommon. The specimen of *Chaetocyperus membranaceus* at the Philadelphia Academy of Sciences is now without achenes, but because of the tubers and striated scales it appeared on examination to be *E. parvula*. Asa Gray[1] has cited the same collection as "*Eleocharis pygmaea*, Torr., the variety with naked achenia noticed in Nicollet's report." Careful measurements of achenes of the type collection of *Scirpus coloradoensis* show an average length (according to the method employed with *E. pauciflora*) of 1.1 mm., in this respect not substantially differing from *E. parvula*. The best-developed collection of *E. parvula* var. *anachaeta* that I have studied is *Runyon* no. 182, which has green culms 10–12 cm. long and green spikelets 6 mm. long, with as many as 23 flowers in a spikelet. The achenes average exactly 1 mm. To the localities cited previously may be added: SOUTH DAKOTA: borders of ponds near James River, *Nicollet Exp.* (N. Y.).[2] IOWA: moist clay flats along shore of Brown's Lake, T. 87 N., R. 47 W., Woodbury Co., Sept. 28, 1933, *Hotchkiss* no. 4578 (B). LOUISIANA: salt marshes, New Orleans, *Hale* no. 56 (N. Y.). TEXAS: *C. Wright* in 1845 (N. Y.); Brownsville, *Runyon* no. 182 (U. S.); San Antonio, *Clemens* in 1911 (Cal.). NEVADA: *A. G. Kennedy*, alkali ground, Elko, no. 4502. NEW MEXICO: in marsh near Loving, *Standley* no. 40354 (U. S.); "moist places near Albuquerque" (Torrey, Pacific R. R. Rept. iv. 152 (1857)), presumably the collection (N. Y.) from "near 35th parallel, Fort Smith to the Rio Grande, *J. M. Bigelow.*" MEXICO: Vera Cruz, Morro de Boquilla, *Liebmann* (Kew, mixed with *E. retroflexa*). This collection is included under *Chaetocyperus polymorphus* β. *capillaceus* by Liebmann, Mex. Halvgraes 242 (1851). CUBA: Pinar del Rio, *Ekman* no. 16567 (det. *Kukenthal*), a collection which has practically smooth achenes.

The Californian plant (*E. leptos* var. *Johnstonii*) differs only in its larger achenes and recurved culms. Further collections will show whether these characteristics are constant. Steudel's improperly constructed specific name is untenable because of Clarke's *Eleocharis lepta* from South Africa. Dr. N. C. Fassett has sent me sterile material from Devil's Lake, Sauk Co., Wisconsin, which judging from the tuber-

[1] Proc. Acad. Sci. Philadelphia 1862 167 (1862).

[2] This locality was incorrectly reported in my previous paper. Following the route of the *Nicollet Expedition* (1839) as given by G. W. Warren in Pacific R. R. Rept. xi. 40–42 (1859) and outlined on a map accompanying the report, the station appears to be in what is now Faulk County.

bearing rootstocks is apparently *E. parvula.* This is true also of the sterile specimens with remarkably fleshy culms from Quebec and New Brunswick, which I believed to be *Sagittaria graminea.*[1] Typical *E. parvula,* in addition to its common occurrence on the seashore of eastern United States, is widespread in Europe on borders of the Baltic, North and Mediterranean Seas.

2. A New Eleocharis from Brazil

Eleocharis **squamigera**, n. sp. (Pl. 320, fig. 8) rhizomata elongata, cum squamis rubris instructa; culmis tenuibus sulcatis 5–20 cm. longis erectis vel recurvatis; vaginae apice acuto non mucronato; spicula ovata acutiuscula, 3–5 cm. longa, viridi vel castanea; gluma infima sterili, obtusa, hyalina; glumis ceteris acutiusculis carina viridibus cum lateribus roseis et margine hyalino; staminibus 2, antheris 0.8 mm. longis; stylo 3-fido; achaeniis quasi inter *E. acicularem* et *E. fistulosam,* trigonis vel plano-convexis, luteo-brunneis 1 mm. longis, longitudinaliter striatis et inter costas horizontaliter trabeculatis; stylobasi late conico-triangulato, acuto, brunnescenti; setis 6 luteo-brunneis tenuissimis, stylobasi aequilongis.—Brazil: Parana, Jaguariahyna in palud. *Dusén* 13276 (type in Gray Herb.).

This specimen has the appearance of *E. tenuis* [*E. capitata* var. *typica*] and was so named by Pfeiffer. The systematic position is uncertain. In some respects the plant resembles the *Aciculares,* but the lowest scale of the spikelet is sterile. The surface markings have a similarity on a small scale to those of *E. fistulosa.*

Explanation of Plate 320

(Habit-drawing ½ ×; achenes 20 ×)

Fig. 1, Eleocharis pauciflora, Scotland, *Fernald, Pease & Long* 2329; 2, E. pauciflora var. Fernaldii, Maine, *Fernald & Long* 12822; 3, E. pauciflora var. bernardina, California, *Hall* 7605; 4, E. pauciflora (*E. atacamensis*), Chile, *Werdermann* 1297; 5, E. parvula var. anachaeta, Louisiana, *Drummond* 409; 6, E. parvula, New York, *Svenson* 4712; 7, E. margaritacea, Kamtchatka, *Hultén* 1083; 8, E. squamigera, Brazil, *Dusén* 13276; 9, E. rostellata, New York, *Svenson* 4887.

Explanation of Plate 321

Eleocharis pauciflora, habit, a little less than ½ ×, achenes 10 ×. Figs. 1 and 3, Scotland, *Fernald, Pease & Long* 2329; 2 and 5, Maine, *Fernald & Long* 12822 (var. Fernaldii); 4, Switzerland, *Fl. Rhaetica* 414; 6, Tibet, *Hooker;* 7 and 9, Chile, *Johnston* 4711; 8, California, *Hall* 7605 (var. bernardina); 10, Chile, *Werdermann* 1297 (*E. atacamensis*); 11, Washington, *Suksdorf* 2237 (var. Suksdorfiana). Photo. by L. Buhle.

Plantago altissima in Massachusetts.—Sometime ago I was checking various items in Rhodora against my own herbarium, and

[1] See Rhodora xxxi. 169 (1929).

came across Professor Fernald's note on this species from the "Connecticut Coast" by H. S. Clark (Rhodora **24**: 204). I was consequently pleased to find in my own collection a very fine specimen of *P. altissima* L. from Nantucket, originally in the herbarium of Fred G. Floyd, which I bought in 1921. The specifications are "Edge of cultivated field, abundant; near Hummock Pond; June 7, 1906; *F. G. Floyd*, no. 2334." I took the sheet to the Gray Herbarium and made careful comparison with the European sheets and modern European floras. There is no better or more robust specimen in the Gray Herbarium than this one from Nantucket. Unfortunately a search through Mr. Floyd's unmounted duplicates fails to reveal another.—Ludlow Griscom, Museum of Comparative Zoology, Harvard University.

VALIDITY OF THE NAME LESPEDEZA[1]

B. P. G. Hochreutiner

I have read with great interest the article of P. L. Ricker concerning the Læguminose genus *Lespedeza*. I take now the liberty of expressing an opinion because I have been appointed by the International Nomenclature Commission to make the French version of the Rules which Dr. Briquet, former Rapporteur général, unfortunately could not elaborate.

That is why I want to say that I fully agree with Mr. Ricker when he "hopes that no overenthusiastic botanist will seize this case as an opportunity to make a new name or corrections sufficiently different in appearance to think he is entitled to place his name after all of the new combinations thus involved."

Unhappily, the Art. 70 of the new Rules is as follows: "the original spelling of a name must be retained except in the case of a typographic error or a clearly unintentional orthographic error."

Therefore, if things stand as Ricker states, any botanist is entitled: 1) to correct *Lespedeza* to begin with *Ces*; 2) to change *Cespedesia* (Ochnaceae) to some other name because it would be so similar to the altered *Lespedeza* that it creates confusion (Art. 70, paragraph 3) as the editors of *Rhodora* correctly remark in the last foot note. These changes in the generic names would involve of course changes in specific combinations.

[1] Apropos an article of P. L. Ricker, Rhodora, xxxvi, 130–132 (1934).

Therefore, I consider that the publication of Ricker is particularly unfortunate, as it will call the attention of the "over-enthusiastic botanists" to a fact which they would have always ignored.

Now, I believe I am keeping the spirit of Briquet if I study the case, in order to prevent as far as possible changes in nomenclature. To stop such superfluous changes, there would be, of course, one method: a proposition to the Nomenclature Commission and a decision of a congress to add *Lespedeza* to the list of the *nomina utique conservanda* (Art. 21, note 1).

However, until the decision is taken, the "*over-enthusiastics*" will have published perhaps the new combinations and it may be useful to prevent it. That is why I venture to propose the following explanation, which is in perfect legal accordance with the Rules.

I note first the *Recommandation XXX* of the Vienna Rules: "The liberty of making orthographic corrections must be used with reserve, especially if the change affects the first syllable and above all the first letter of a name." That was the *article* 66 of the Paris laws, and it is very much to be regretted that so wise an advice was left out (although not contradicted) in the last edition of Cambridge.

But that is common sense and even if common sense is not enforced by law it still retains its authority.

Secondly, I must remind the reader that Ricker showed that the governor of Florida, in honour of whom the genus *Lespedeza* was named, bears a name which is written differently in various documents: V. M. de Céspedes or V. M. de Zespedes (*cf.* footnote of Ricker, p. 131).

Further, we must remark that in pure Spanish, C and Z, followed by an *e* are pronounced like the English *th*, a sound which it is impossible to transcribe in Latin.

Therefore, it is impossible to assume with absolute certainty that Michaux or the publishers, Richard or Michaux's son, did not *deliberately* alter the name and write it with an L, in order to meet French euphony.[1] Of course, one may *suppose* that it is due to an error of a copyist, but I wish to emphasize the fact that the slightest doubt prevents a correction, even on the ground of the new Cambridge Rules, in which the somewhat unusual expression, "only *unintentional orthographic errors* may be corrected" is used.

[1] The proof that elder naturalists changed often and deliberately letters in names on account of euphony or of special pronounciations can be found in the very same instance because Michaux wrote *Lespedeza* with a *z* in the second part of the word as *Cespedes* or *Zespedes* is always written with an s at the end. No doubt Michaux did so deliberately because he wanted to express in latin the very strong pronunciation by the Spaniards of the letter s.

Dr. Rendle, one of the most distinguished members of the International Nomenclature Commission, interprets that in saying that there *may be intentional orthographic errors*, i. e. orthographical changes deliberately adopted by the author, and these cannot be modified.

Now, if there is a case in which a so-called intentional error may be considered, it is this one, because the author of the name *Lespedeza* could not possibly guess how it should be written. It is so much the more obvious that if an "over-enthusiastic" botanist would correct it to-day, it would be quite impossible, because he would not know how. If he corrects it to begin with *Ces*, he will be unable to prevent another from correcting it to begin with *Zes*, *Thes*, or even *Fes* to satisfy the Portuguese pronounciation. We would have thus five valid names for the same thing, a very queer consequence of "overenthusiasm" in botany.

We conclude, therefore, that nobody is entitled to alter the name *Lespedeza* and, consequently, the well-known Ochnaceous name *Cespedesia* remains also perfectly valid.

BOTANICAL GARDEN AND MUSEUM,
Geneva.

DRABA IN TEMPERATE NORTHEASTERN AMERICA

M. L. FERNALD

(*Concluded from page 371*)

LIST OF EXSICCATAE CITED

Abbe, E. C.

371 glabella Pursh
372 nivalis Liljebl.
374 crassifolia Graham
375 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
376 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
377 nivalis Liljebl.
378 nivalis Liljebl.
379 fladnizensis Wulfen, var., heterotricha (Lindbl.) Ball
380 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
381 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
383 nivalis Liljebl.
384 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
385 rupestris R. Br.
386 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
387 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
1261 glabella Pursh, var. megasperma (Fernald & Knowlt.) Fernald
1262 norvegica Gunner

Abee & Brooks

364 glabella Pursh
365 glabella Pursh
366 norvegica Gunner
367 glabella Pursh
368 norvegica Gunner

Abbe & Hogg

369 nivalis Liljebl.

Abbe, Hogg & Forbes

370 incana L., var. confusa (Ehrh.) Liljebl.

Abbe & Odell

373 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
382 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball

Abbe & Pease

363 norvegica Gunner

Allen, J. A.

25 glabella Pursh
76 incana L., var. confusa (Ehrh.) Liljebl.

Bell, Robert

2027 rupestris R. Br.

Bishop, Harlow

324 nivalis Liljebl.
325 glabella Pursh
326 glabella Pursh
327 incana L.

Blake, S. F.

5590 incana L., var. confusa (Ehrh.) Liljebl.

Bowdoin College Expedition, 1891.

269 incana L.

Butters & Buell

367 arabisans Michx.

Butters & Holway

40 aurea M. Vahl

Campbell, Robert

66,722 glabella Pursh

Collins & Fernald

88 incana L.
89 incana L., var. confusa (Ehrh.) Liljebl.
90 lanceolata Royle
91 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
94 pycnosperma Fern. & Knowlt.

Cooper, W. S.

40 arabisans Michx. and arabisans, var. canadensis (Brunet) Fern. & Knowlt.
112 incana L.

Delabarre, E. B.

93 aurea M. Vahl

Dodge, Griscom & Pease

25,773 clivicola Fernald

Dodge & Pease

25,787 nivalis Liljebl.
26,130 clivicola Fernald

Eames, A. J.

12,081 arabisans Michx.

Eggleston, W. W.

132 arabisans Michx.

Ehlers, J. H.

1103 arabisans Michx.
1352 arabisans Michx.

Erdmann

63 aurea M. Vahl

Erlanson, C. & E.

648 arabisans Michx.

Fassett, N. C.

15,566 lanceolata Royle

Fernald, Bartram, Long & St. John

7503 incana L., var. confusa (Ehrh.) Liljebl.
7504 incana L., var. confusa (Ehrh.) Liljebl.

Fernald & Collins

92 arabisans Michx.
93 arabisans Michx.
226 Allenii Fernald
577 minganensis (Victorin) Fernald
578 minganensis (Victorin) Fernald
579 minganensis (Victorin) Fernald
580 glabella Pursh, var megasperma (Fern. & Knowlt.) Fernald
581 Allenii Fernald
582 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
583 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
1064 minganensis (Victorin) Fernald
1065 minganensis (Victorin) Fernald
1066 arabisans Michx.
1067 arabisans Michx.

1068 arabisans Michx.
1069 arabisans Michx.
1070 arabisans Michx.
1071 pycnosperma Fernald & Knowlton
1072 pycnosperma Fernald & Knowlton
1073 pycnosperma Fernald & Knowlton
1074 pycnosperma Fernald & Knowlton
1076 glabella Pursh
1076a glabella Pursh
1077 lanceolata Royle
1078 lanceolata Royle
1079 lanceolata Royle
1080 incana L., var. confusa (Ehrh.) Lilejbl.
1081 incana L., var. confusa (Ehrh.) Lilejbl.
1082 incana L.
1212 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald

Fernald, Dodge & Smith

25,772 arabisans Michx.

Fernald, Griscom & Gilbert

28,355 laurentiana Fernald
28,372 norvegica Gunner

Fernald, Griscom & Mackenzie

25,781 Allenii Fernald
25,786 nivalis Liljebl.

Fernald, Griscom, Mackenzie, Pease & Smith

25,779 Allenii Fernald
25,782 Allenii Fernald
25,785 nivalis Liljebl.

Fernald, Griscom, Pease & Smith

25,783 Allenii Fernald
25,789 clivicola Fernald

Fernald & Gilbert

28,365 glabella Pursh

Fernald & Long

28,343 nivalis Liljebl.
28,344 nivalis Liljebl.
28,345 nivalis Liljebl.
28,346 nivalis Liljebl.
28,349 incana L., var. confusa (Ehrh.) Liljebl.
28,358 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
28,366 arabisans Michx.
28,367 arabisans Michx.
28,369 pycnosperma Fern. & Knowlt.
28,370 glabella Pursh
28,371 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
28,391 norvegica Gunner
28,396 norvegica Gunner
28,397 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
28,398 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
28,399 norvegica Gunner, var. pleiophylla Fernald
28,400 norvegica Gunner and var. pleiophylla Fernald
28,401 norvegica Gunner
28,402 norvegica Gunner
28,403 glabella Pursh
28,407 norvegica Gunner, var. pleiophylla Fernald
28,408 norvegica Gunner
28,408a norvegica Gunner, var. pleiophylla Fernald
28,409 norvegica Gunner
28,410 norvegica Gunner

Fernald, Long & Dunbar

26,703 norvegica Gunner
26,704 norvegica Gunner
26,705 norvegica Gunner, var. pleiophylla Fernald
26,706 incana L., var. confusa (Ehrh.) Lijebl.
26,707 incana L., var. confusa (Ehrh.) Lijebl.
26,708 incana L., var. confusa (Ehrh.) Lijebl.
26,709 incana L., var. confusa (Ehrh.) Lijebl.
26,710 norvegica Gunner
26,711 norvegica Gunner
26,712 norvegica Gunner and var. hebecarpa (Lindbl.) O. E. Schulz
26,713 laurentiana Fernald
26,714 laurentiana Fernald
26,715 incana L., var. confusa (Ehrh.) Liljebl.

Fernald, Long & Fogg

281 norvegica Gunner
1729 incana L., var. confusa (Ehrh.) Liljebl.

1730 incana L., var. confusa (Ehrh.) Liljebl.
1731 laurentiana Fernald
1732 arabisans Michx.
1733 arabisans Michx.
1735 arabisans Michx.
1736 arabisans Michx.
1737 glabella Pursh
1738 arabisans Michx.
1739 arabisans Michx.
1740 arabisans Michx.
1741 norvegica Gunner
1742 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
1743 norvegica Gunner
1744 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
1745 norvegica Gunner
1746 norvegica Gunner, var pleiophylla Fernald
1747 norvegica Gunner, var. pleiophylla Fernald
1748 norvegica Gunner, var. pleiophylla Fernald
1748½ glabella Pursh
1749 arabisans Michx., var canadensis (Brunet) Fern. & Knowlt.
1750 norvegica Gunner, var. pleiophylla Fernald
1751 glabella Pursh
1752 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald

Fernald, Long & Gilbert

28,352 incana L., var. confusa (Ehrh.) Liljebl.

Fernald, Long & St. John

7505 incana L., var. confusa (Ehrh.) Liljebl.

Fernald & Pease

3316 arabisans Michx.
3317 arabisans Michx., var canadensis (Brunet) Fern. & Knowlt.
3318 lanceolata Royle
25,089 incana L.
25,090 arabisans Michx.
25,091 arabisans Michx.
25,092 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
25,093 glabella Pursh
25,094 glabella Pursh and var. orthocarpa (Fern. & Knowlt.) Fern.
25,095 glabella Pursh
25,096 clivicola Fernald
25,097 Allenii Fernald
25,099 nivalis Liljebl.
25,100 nivalis Liljebl.

Fernald & Smith

25,777 clivicola Fernald
25,778 clivicola Fernald
25,780 Allenii Fernald
25,784 Allenii Fernald
25,788 nivalis Liljebl.

Fernald & Weatherby

2447 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
2448 glabella Pursh

Fernald, Weatherby & Stebbins

2446 lanceolata Royle

Fernald & Wiegand

3453 incana L., var. confusa (Ehrh.) Liljebl.
3456 glabella Pursh, var. megosperma (Fern. & Knowlt.) Fernald
3458 glabella Pursh, var. megosperma (Fern. & Knowlt.) Fernald
3460 norvegica Gunner, var. pleiophylla Fernald
3461 norvegica Gunner, var. pleiophylla Fernald
3462 norvegica Gunner, var. pleiophylla Fernald
3463 norvegica Gunner, var. pleiophylla Fernald

Fernald, Wiegand & Bartram

5457 glabella Pursh
5458 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
5458a glabella Pursh
5459 norvegica Gunner

Fernald, Wiegand & Darlington

5460 norvegica Gunner
5461 arabisans Michx.
5462 arabisans Michx.
5463 arabisans Michx.

Fernald, Wiegand & Kittredge

3452 incana L.

3454 incana L., var. confusa (Ehrh.) Liljebl.
3455 rupestris R. Br.
3457 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
3459 arabisans Michx.

Fernald, Wiegand & Long

28,263 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
28,347 nivalis Liljebl.
28,351 incana L., var. confusa (Ehrh.) Liljebl.
28,391 norvegica Gunner
28,405 norvegica Gunner
28,406 norvegica Gunner and glabella Pursh
24,412 norvegica Gunner, var. pleiophylla Fernald
28,413 norvegica Gunner

Fernald, Wiegand, Long, Gilbert & Hotchkiss

28,354 incana L., var. confusa (Ehrh.) Liljebl.
28,356 glabella Pursh
28,392 norvegica Gunner
28,393 norvegica Gunner
28,394 norvegica Gunner, var. pleiophylla Fernald
28,411 norvegica Gunner

Fernald, Wiegand, Pease, Long, Griscom, Gilbert & Hotchkiss

20,380 norvegica Gunner, var. pleiophylla Fernald
28,350 incana L., var. confusa (Ehrh.) Liljebl.
28,374 norvegica Gunner
28,380 norvegica Gunner, var. pleiophylla Fernald
28,382 norvegica Gunner
28,383 norvegica Gunner, var. pleiophylla Fernald
28,384 norvegica Gunner
28,385 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
28,386 norvegica Gunner
28,387 norvegica Gunner, var. hebecarpa (Lindbl.) O. E. Schulz
28,388 norvegica Gunner

Gardner, G.

317a glabella Pursh
377 glabella Pursh

Gooding, L. M.

1404 aurea M. Vahl

Griscom, Ludlow

28,364 laurentiana Fernald

Griscom, Mackenzie & Smith

25,770 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald

Griscom & Pease

25,775 clivicola Fernald
25,776 clivicola Fernald

House, H. D.

9436 arabisans Michx.

Johansen, Frits

93,671 incana L., var. confusa (Ehrh.) Liljebl.

Kelsey & Jordan

65 glabella Pursh

Kennedy, R. B.

1 incana L., var. confusa (Ehrh.) Liljebl.
2 incana L., var. confusa (Ehrh.) Liljebl.
3 incana L., var. confusa (Ehrh.) Liljebl.

Low, A. P.

63,140 norvegica Gunner
63,143 glabella Pursh
63,144 glabella Pursh
63,145 aurea M. Vahl
63,146 aurea M. Vahl

McFarlin, J. B.

2174 arabisans Michx.
2246 arabisans Michx.

Mackenzie & Griscom

10,268 arabisans Michx.
10,269 arabisans Michx.
11,079 glabella Pursh
11,089a incana L.

Macoun, J. M.

1920 minganensis (Victorin) Fernald
79,065 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
79,066 glabella Pursh
79,068 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald

79,069 alpina L.
79,070 nemorosa L., var. lejocarpa Liljebl.
79,072 alpina L., var. nana Hook. and fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball

Macoun, John

19 incana L., var. confusa (Ehrh.) Liljebl.
20 arabisans Michx.
178 nemorosa L., var. lejocarpa Liljebl.
477 nemorosa L., var. lejocarpa Liljebl.
2014 nemorosa L., var. lejocarpa Liljebl.
10,276 aurea M. Vahl
18,987 norvegica Gunner

Malte, M. O.

118,919 glabella Pursh, var brachycarpa (Rupr.) Fernald
119,988 alpina L.
120,038 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
120,062 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
120,092 crassifolia Graham
120,098 nivalis Liljebl.
120,136 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
120,136a fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
120,159 nivalis Liljebl.
120,198 glabella Pursh, var. brachycarpa (Rupr.) Fernald
120,203 glabella Pursh
120,209 glabella Pursh
120,243 glabella Pursh, var. brachycarpa (Rupr.) Fernald

Patterson, H. N.

7 aurea M. Vahl

Payson & Payson

5024 aurea M. Vahl

Pease, A. S.

5094 glabella Pursh
5437 pycnosperma Fern. & Knowlt.
5450 pycnosperma Fern & Knowlt.
7350 glabella Pursh
7353 glabella Pursh
7355 arabisans Michx.
7356 arabisans Michx.
7357 glabella Pursh
7358 glabella Pursh
7359 pycnosperma Fern. & Knowlt.
7361 pycnosperma Fern. & Knowlt.
11,981 arabisans Michx.
19,227 glabella Pursh
19,239 pycnosperma Fern. & Knowlt.
20,159 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
20,194 Peasei Fernald
20,205 arabisans Michx.
20,208 arabisans Michx.
20,219 incana L.
20,241 arabisans Michx.
20,242 pycnosperma Fern. & Knowlt.
20,614 lanceolata Royle
23,487 arabisans Michx.
23,633 arabisans Michx.

Pease & Griscom

28,342 nivalis Liljebl.
28,357 laurentiana Fernald
28,377 norvegica Gunner
28,378 norvegica Gunner, var. pleiophylla Fernald
28,379 glabella Pursh

Pease & Long

28,359 laurentiana Fernald
28,360 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
28,390 norvegica Gunner

Pease, Long & Gilbert

28,373 norvegica Gunner

Pease & Smith

25,771 clivicola Fernald
25,774 clivicola Fernald

Perry & Myers

750 aprica Beadle
751 aprica Beadle

Potter, David

546 minganensis (Victorin) Fernald
549 norvegica Gunner
584 incana L., var. confusa (Ehrh.) Liljebl.

Povah, Brown & McFarlin

3671B incana L.

Priest, M. E.

E1 laurentiana Fernald

Rolland-Germain

15,640 arabisans Michx., var. canadensis (Brunet) Fernald & Knowlt.

Rousseau, Jacques

24,831 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
24,833 arabisans Michx.
24,841 arabisans Michx.
26,322 arabisans Michx., var. canadensis (Brunet) Fern. & Knowlt.
26,353 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
26,389 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
26,442 glabella Pursh
26,487 arabisans Michx.
26,503 glabella Pursh
26,508 glabella Pursh
26,548 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
26,582 minganensis (Victorin) Fernald
26,585 lanceolata Royle
26,613 arabisans Michx.
26,695 arabisans Michx.
26,703 arabisans Michx.
31,007 minganensis (Victorin) Fernald
31,072 glabella Pursh
31,150 pycnosperma Fern. & Knowlt.
31,151 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
31,214 incana L.
31,222 incana L.
31,223 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
32,335 arabisans Michx.

Rydberg, P. A.

516 aurea M. Vahl
9666 arabisans Michx.

St. John, Harold

1890 incana L., var. confusa (Ehrh.) Liljebl.
90,475 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
90,476 glabella Pursh
90,477 incana L.
90,478 incana L., var. confusa (Ehrh.) Liljebl.
90,479 incana L., var. confusa (Ehrh.) Liljebl.
90,480 incana L., var. confusa (Ehrh.) Liljebl.
90,481 incana L., var. confusa (Ehrh. Liljebl.
90,482 incana L., var. confusa (Ehrh.) Liljebl.
90,484 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
90,485 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald

Schmitt, C.

289 alpina L.

Sewall, C. S.

40 incana L.
77 (in part) incana L., var. confusa (Ehrh.) Liljebl.
79 incana L.
169 incana L., var. confusa (Ehrh.) Liljebl.
516 nivalis Liljebl.
519 glabella Pursh

Sornborger, J. D.

61 Sornborgeri Fernald
70 incana L.
173 glabella Pursh
175 crassifolia Graham and Sornborgeri Fernald

Spreadborough, W.

16,272 glabella Pursh

Stebbins, G. L., jr.

783 arabisans Michx.

Stebbins et al.

143 lanceolata Royle
144 lanceolata Royle

Stecker, Adolph

212x fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
216 aurea M. Vahl

Turner, L. M.

4842 glabella Pursh
6316 glabella Pursh

Victorin, Marie-

30 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
573 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
3140 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
3203 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
3867 arabisans Michx.
4128 arabisans Michx.
4134 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
4139 incana L.
9587 glabella Pursh
15,638 arabisans Michx.
15,639 arabisans Michx.
24,839 arabisans Michx.

Victorin, Brunel & Rousseau

17,376 pycnosperma Fernald & Knowlton
17,377 pycnosperma Fernald & Knowlton

Victorin & Rolland

9484 incana L., var. confusa (Ehrh.) Liljebl.
9485 incana L., var. confusa (Ehrh.) Liljebl.
9486 incana L., var. confusa (Ehrh.) Liljebl.
18,244 laurentiana Fernald
18,245 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fern.
18,246 laurentiana Fernald
18,247 incana L., var. confusa (Ehrh.) Liljebl.
18,248 incana L., var. confusa (Ehrh.) Liljebl.
18,249 incana L., var. confusa (Ehrh.) Liljebl.
18,250 incana L., var. confusa (Ehrh.) Liljebl.
18,251 laurentiana Fernald
18,252 laurentiana Fernald
18,253 laurentiana Fernald
18,254 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
18,255 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
18,256 laurentiana Fernald
18,257 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
18,383 glabella Pursh
21,032 incana L.
21,465 incana L., var. confusa (Ehrh.) Liljebl.
21,466 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
21,469 glabella Pursh, var. orthocarpa (Fern. & Knowlt.) Fernald
21,471 glabella Pursh
21,472 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
21,475 incana L., var. confusa (Ehrh.) Liljebl.
21,476 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
21,477 laurentiana Fernald
21,478 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
21,481 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,828 minganensis (Victorin) Fernald
24,861 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,862 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,863 laurentiana Fernald
24,864 incana L.
24,865 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,866 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,867 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
24,869 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
27,192 incana L.
27,310 incana L.

27,311 incana L.
27,312 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
27,313 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
27,314 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald

Victorin, Rolland, Brunel & Rousseau

17,375 pycnosperma Fernald & Knowlton
17,378 arabisans Michx.
17,379 pycnosperma Fernald & Knowlton
17,380 pycnosperma Fernald & Knowlton
17,381 incana L.
17,382 arabisans Michx.
17,383 arabisans Michx.
17,384 incana L.
17,386 incana L.
17,387 pycnosperma Fernald & Knowlton

Victorin, Rolland & Jacques

33,437 arabisans Michx.
33,586 arabisans Michx.
33,675 nivalis Liljebl.
33,676 glabella Pursh
33,774 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald

Victorin, Rolland & Louis-Marie

21,467 incana L.
21,468 incana L.
21,473 incana L.
21,474 glabella Pursh
21,479 incana L.

Waghorne, A. C.

14 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald
19 glabella Pursh
22 arabisans Michx.
27 norvegica Gunner

Wetmore, R. H.

102,959 incana L.

Wiegand, Gilbert & Hotchkiss

28,353 incana L., var. confusa (Ehrh.) Liljebl.
28,368 arabisans Michx.
28,375 norvegica Gunner
28,376 norvegica Gunner
28,389 norvegica Gunner
28,395 norvegica Gunner

Wiegand, Griscom & Hotchkiss

28,348 incana L.
28,360 laurentiana Fernald
28,361 glabella Pursh, var. megasperma (Fern. & Knowlt.) Fernald

Wolf & Rothrock

634 aurea M. Vahl

Woodworth, R. H.

239 fladnizensis Wulfen, var. heterotricha (Lindbl.) Ball
240 nivalis Liljebl.
240½ glabella Pursh

EXPLANATION OF PLATES 290–319

Plate 290. Draba alpina L. Fig. 1, flowering plant, × 1, from Dovre, Norway, July, 1902, *Gustaf Peters;* fig. 2, small fruiting plant, × 1, from Torne Lappmark, July 21, 1924, *Carl G. Alm;* fig. 3, portion of rosette, × 10, to show long ciliation, from same collection as fig. 2; fig. 4, summit of scape, × 10, from same collection as figs. 2 and 3; fig. 5, fruiting plant, × 1, of var. nana Hook., from Mansfield Island, Hudson Bay, August 30, 1884, *R. Bell* (isotype of *D. Bellii* Holm); fig. 6, flowering plant × 1, of var. nana, from North Star Bay, Thule, northwest Greenland, *W. E. Ekblaw*, no. 411; fig. 7, leaves, × 10, of no. 411.

Plate 291. D. fladnizensis Wulfen, var. heterotricha (Lindblom) Ball. Fig. 1, small plant in flower, × 1, from North Star Bay, northwestern Greenland, *Ekblaw*, no. 421; fig. 2, fruiting plant, × 1, from East Bay, Ikordlearsuk, Labrador, *Abbe & Odell*, no. 382; fig. 3, tips of leaves, × 10, from *Ekblaw*, no. 421; figs. 4 and 5, valve and septum, × 10, from Torne Lappmark, Sweden, August 27, 1917, *Carl G. Alm.*

PLATE 292. D. ALLENII Fernald, n. sp. FIG. 1, small piece of flowering plant, × 1, from Pease Basin, between Mts. Logan and Pembroke, Matane Co., Quebec, *Fernald et al.*, no. 25,782; FIG. 2, small piece of fruiting plant from Tabletopped Mountain, Gaspé Co., Quebec, August 10, 1881, *J. A. Allen;* FIG. 3, portion of rosette, × 10, from Fernald Pass, Mt. Mattaouisse, Quebec, *Fernald et al.*, no. 25,779 (TYPE of species); FIG. 4, flowers from no. 25,782; FIGS. 5 and 6, valve and septum, with seeds, × 10, from FIG. 2.

PLATE 293. D. RUPESTRIS R. Br. FIG. 1, small flowering plant, × 1, from the type locality, Ben Lawers, Scotland, *Arnott;* FIG. 2, fruiting plant from Pointe Riche, Newfoundland, *Fernald & Wiegand*, no. 3455; FIG. 3, flowering plant from Battle Island, Labrador, August 3, 1913, *W. E. Ekblaw;* FIG. 4, rosette-leaves, × 10, from Pointe Riche, Newfoundland, no. 3455.

PLATE 294. D. CRASSIFOLIA Graham. FIG. 1, three of the original specimens, × 1, from summits of the Rocky Mts., *Drummond;* FIG. 2, two plants, × 1, from Ramah, Labrador, *Sornborger*, no. 175; FIG. 3, fruiting plant, × 1, from Disco, Greenland, June 28, 1924, *M. P. Porsild;* FIG. 4, flowering plant, × 1, from Disco, June 27, 1929, *R. T. Porsild;* FIG. 5, leaf and base of scape, × 10, from Ramah, *Sornborger*, no. 175; FIG. 6, flower, × 10, from Disco, Greenland, June 27, 1929, *R. T. Porsild.*

PLATE 295. D. NIVALIS Liljeblad and D. PEASEI Fernald, n. sp. FIG. 1, flowering plant, × 1, of D. NIVALIS, from North Star Bay, Thule, northwestern Greenland, *Ekblaw*, no. 238; FIG. 2, fruiting plant, × 1 of D. NIVALIS from Hayes Harbor, near Etah, Greenland, *Ekblaw*, no. 239; FIG. 3, rosette-leaves, × 10, of D. NIVALIS from Little Quirpon, Newfoundland, *Fernald & Long*, no. 28,343; FIG. 4, type of D. PEASEI, × 1, from Cape Rosier, Quebec, *Pease*, no. 20,194; FIG. 5, tips of rosette-leaves of D. PEASEI, × 10, from the TYPE; FIG. 6, valve, × 10, of D. PEASEI, from the TYPE; FIG. 7, septum and seeds, × 10, of D. PEASEI, from the TYPE.

PLATE 296. D. AUREA M. Vahl. FIG. 1, small flowering plant, × 1, from Upernivik Ø, Sandsten, Greenland, 14 Juli 1929, *M. P. & R. T. Porsild;* FIG. 2, fruiting stem, × 1, from same collection as FIG. 1; FIG. 3, large fruiting plant, × 1, from Sheep Mt., Waterton Lake, Alberta, *J. Macoun*, no. 10,276.

PLATE 297. D. MINGANENSIS (Victorin) Fernald, n. sp., and D. LUTEOLA Greene. FIGS. 1, 2 and 3, small flowering plants of D. MINGANENSIS, × 1, from Île Nue, Archipel de Mingan, Quebec, *Victorin & Rolland*, no. 24,828 (ISOTYPES of *D. luteola*, var. *minganensis* Victorin); FIG. 4, flower from ISOTYPE of D. MINGANENSIS, × 10, showing villous sepals; FIG. 5, dwarf (starved) plant of D. MINGANENSIS, × 1, from under Cap Original, Bic, Quebec, *Fernald & Collins*, no. 578; FIG. 6, fruiting plant of D. LUTEOLA, × 1, from near Pagosa Peak, Colorado, *C. F. Baker*, no. 351; FIG. 7, silique, × 10, of no. 351.

PLATE 298. D. MINGANENSIS (Victorin) Fernald, n. sp. FIG. 1, fruiting plant, well developed, × 1, from Cap Enragé, Bic, Quebec, July 8, 1905, *Williams, Collins & Fernald;* FIG. 2, portion of inflorescence, × 10, showing the villous sepals and villous-hirsute ovary, from Cap Enragé, *Fernald & Collins*, no. 1065; FIG. 3, upper half of silique, × 10, from no. 1065.

PLATE 299. D. INCANA L., var. CONFUSA (Ehrh.) Liljeblad, figs. all × 1. FIG. 1, small plant, showing leafy to leafless fruiting stems (2 stems at left = var. *nana* Lindbl.) from Ile Kécarpoui, Archipel de Kécarpoui, Quebec, *St. John*, no. 90,480; FIG. 2, dwarfed xerophytic extreme (isotype of var. *conica*

O. E. Schulz), from Cap Barré, Percé, Quebec, *Collins & Fernald*, no. 89; FIG. 3, plant from moist and fertile habitat, Cow Head, Newfoundland, *Fernald & Wiegand*, no. 3453; FIG. 4, dwarf xerophytic plant, with leafless or few-leaved stems (var. *nana* Lindbl.), from Sandy Cove, Ingornachoix Bay, Newfoundland, *Fernald, Long & Dunbar*, no. 26,709; FIG. 5, slender plant from same station as FIG. 2; FIG. 6, leafy plant (var. *stricta* Hartm.) from Îlets de la Baie à Jean, Quebec, *Victorin & Rolland*, no. 18,249.

PLATE 300. D. SORNBORGERI Fernald, n. sp., and D. CRASSIFOLIA Graham, var. PARRYI (Rydb.) O. E. Schulz. FIG. 1, TYPE, × 1, of D. SORNBORGERI, from Ramah, Labrador, *Sornborger*, no. 61; FIG. 2, flower, × 10, of D. SORNBORGERI, from Ramah, *Sornborger*, no. 175 in part; FIG. 3, valve, × 1, from TYPE of D. SORNBORGERI; FIGS. 4 and 5, plants, × 1, of D. CRASSIFOLIA, var. PARRYI from Gray's Peak and vicinity, Colorado, *Patterson*, no. 6.

PLATE 301. D. NORVEGICA Gunner. FIG. 1, small fruiting plant, × 1, from Aurland, Norway, August 12, 1928, *Johannes Lid;* FIG. 2, dwarf plant in flower, × 1, from Deadman Cove, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 28,376; FIG. 3, small flowering plant, × 1, from Crow's Head, St. John Bay, Newfoundland, *Fernald, Long & Fogg*, no. 1743; FIG. 4, fragment of flowering mat (of 20 stems), × 1, from Flower Cove, Newfoundland, *Fernald, Griscom & Gilbert*, no. 28,372; FIG. 5, fragment of fruiting plant, × 1, from Piton Point, Newfoundland, *Wiegand, Gilbert & Hotchkiss*, no. 28,395; FIG. 6, tips of rosette-leaves, × 10, from 28,376.

PLATE 302. D. NORVEGICA Gunner, var. PLEIOPHYLLA Fernald, n. var. FIG. 1, portion of fruiting plant, × 1, from Ha-Ha Mountain, Newfoundland, *Fernald & Long*, no. 28,399; FIG. 2, flowering plant, × 1, from Burnt Cape, Newfoundland, *Fernald et al.*, no. 20,380 (TYPE of the variety); FIG. 3, bases of rosette-leaves and lowest internode, × 10, from Big Brook, Newfoundland, *Fernald & Long*, no. 28,407; FIG. 4, silique, × 10, from no. 28,399.

PLATE 303. D. CLIVICOLA Fernald, n. sp. FIG. 1, flowering plant, × 1, of the TYPE collection, Big Chimney, Mt. Mattaouisse, Quebec, *Dodge, Griscom & Pease*, no. 25,773; FIG. 2, fruiting plant, × 1, of TYPE collection; FIG. 3, portion of internodes, × 10, from Mt. Pembroke, Quebec, *Griscom & Pease*, no. 25,775; FIG. 4, tip of rosette-leaf, × 10, from Fernald Pass, Mt. Mattaouisse, *Fernald & Smith*, no. 25,777; FIG. 5, portion of inflorescence, × 10, from no. 25,775; FIG. 6, valve of ripe silique, × 10, from Mt. Pembroke, *Fernald & Smith*, no. 25,778.

PLATE 304. D. LAURENTIANA Fernald, n. sp. FIG. 1, small flowering plant, × 1, from Flower Cove, Newfoundland, *Fernald, Griscom & Gilbert*, no. 28,355; FIG. 2, portion of flowering plant (divided), × 1, from Îlets Perroquets, Archipel de Mingan, Quebec, *Victorin & Rolland*, no. 18,252; FIG. 3, portion of internode, × 10, from the TYPE, Grassy Island, St. John Bay, Newfoundland, *Fernald, Long & Fogg*, no. 1731; FIG. 4, valve of ripe silique, × 10, from the TYPE, no. 1731.

PLATE 305. D. LAURENTIANA Fernald, n. sp. FIG. 1, fruiting stem, × 1, from the TYPE, Grassy Island, St. John Island, Newfoundland, *Fernald, Long & Fogg*, no. 1731; FIG. 2, portion of basal-rosette, × 10, from the TYPE; FIG. 3, flower, × 10, from Flower Cove, Newfoundland, *Fernald, Griscom & Gilbert*, no. 28,355.

PLATE 306. D. PYCNOSPERMA Fernald & Knowlton. FIG. 1, small fruiting plant, × 1, from Île Bonaventure, Gaspé Co., Quebec, *Victorin, Rolland,*

Brunel & Rousseau, no. 17,376; FIG. 2, portion of young basal rosette, × 10, from Bonaventure Island, *Fernald & Collins*, no. 1073; FIG. 3, portion of internode, × 10, from Cap Blanc, Percé, Quebec, *Collins & Fernald*, no. 94; FIG. 4, septum and characteristically crowded seeds, × 10, from no. 94; FIG. 5, outer surface of valve, × 10, from no. 94.

PLATE 307. D. GLABELLA Pursh. FIG. 1, flowering plant, × 1, from St. Anthony, Newfoundland, *Abbe & Brooks*, no. 365; FIG. 2, flowering plant, × 1, from Cape Mugford Peninsula, Labrador, *Abbe*, no. 371; FIG. 3, fruiting stems, × 1, from mouth of Frazer River, Labrador, *Bishop*, no. 325 (near Nain, type-region of *D. Henneana* Schlechtend.); FIG. 4, portion of basal rosette, × 10, from New World Island, Newfoundland, *Fernald, Wiegand & Bartram*, no. 5457; FIG. 5, portion of internode, × 10, from Port Manvers, Labrador, *Dutilly & Gardner*, no. 317 a; FIG. 6, upper half of silique, × 10, from *Fernald, Wiegand & Bartram*, no. 5457.

PLATE 308. D. GLABELLA Pursh, all figs. × 1. FIG. 1, one of the 3 identical TYPE plants of D. GLABELLA in Herb. Brit. Mus. (from photograph presented by the Keeper, Mr. J. Ramsbottom); FIG. 2, type of D. HENNEANA Schlechtendal in Herb. Bot. Mus. Berlin-Dahlem (photographed by Dr. L. B. Smith from the original specimen loaned by the Curator, Prof. Johannes Milbraed); FIG. 3, TYPE of D. DAURICA DC. in Herb. DeCandolle (from photograph presented by Dr. Alfred Becherer and Mr. J. Francis Macbride).

PLATE 309. D. GLABELLA Pursh, var. ORTHOCARPA (Fernald & Knowlton) Fernald. FIG. 1, small plant, × 1, of the TYPE collection of *D. arabisans*, var. *orthocarpa* Fernald & Knowlton, from Bic, Quebec, July 15–18, 1904, *Collins & Fernald;* FIG. 2, septum and seeds, × 10, from the TYPE; FIG. 3, valve, × 10, from the TYPE (note the veiny surface as in D. GLABELLA, as contrasted with the essentially veinless silique of D. ARABISANS).

PLATE 310. D. GLABELLA Pursh, var. BRACHYCARPA (Ruprecht) Fernald. FIG. 1, fruiting stems, × 1, from Disco, Greenland, August 12, 1902, *M. P. Porsild;* FIG. 2, flowering plant, × 1, from Godhavn, Greenland, *Simmons*, no. 16; FIG. 3, silique, × 10, from same plant as fig. 2; FIG. 4, septum and seeds, × 10, from fig. 2.

PLATE 311. D. GLABELLA Pursh, var. MEGASPERMA (Fernald & Knowlton) Fernald. FIG. 1, portion of flowering plant from Vieille Romaine, Archipel Ouapitagone, Quebec, *St. John*, no. 90,484; FIG. 2, portion of fruiting plant, × 1, from Île St. Charles, Archipel de Mingan, Quebec, *Victorin & Rolland*, no. 18,254; FIG. 3, portion of fruiting plant, × 1, from Forteau, Labrador, *Fernald & Wiegand*, no. 3457.

PLATE 312. D. GLABELLA Pursh, var. MEGASPERMA (Fernald & Knowlton) Fernald. Figs., × 10, all from the TYPE of *D. megasperma* Fernald & Knowlton: Paspebiac Lighthouse, Quebec, July 26, 1902, *Williams & Fernald.* FIG. 1, portion of basal rosette; FIG. 2, portion of lowest (fractured) internode; FIG. 3, valve of ripe silique; FIG. 4, septum and seeds.

PLATE 313. D. MCCALLAE Rydberg. FIG. 1, one of the two flowering plants, × ½, from valley below Mt. Aylmer, near Banff, Alberta, *McCalla*, no. 2267 (TYPE of species); FIG. 2, fruiting stem, × ½, from Larch Valley, Banff, *N. B. Sanson*, no. 82; FIG. 3, rosette-leaves, × 10, from head of Ptarmigan Valley, Alberta, *S. Brown*, no. 387; FIG. 4, portion of lower internode, × 10, from no. 387; FIG. 5, portion of flower, × 10, from TYPE, to show pilose ovary; FIG. 6, silique, × 10, from *Sanson*, no. 82.

PLATE 314. D. ARABISANS Michx. FIG. 1, portion of flowering branch, × 1, from Jack Fish, Ontario, *Pease & Bean*, no. 23,487; FIG. 2, fruiting branch, × 1, from the type region, Gardiner's Island, Lake Champlain, Vermont, June 17, 1881, *Faxon;* FIG. 3, characteristically forking fruiting branch, × 1, from St. Fabien, Quebec, *Fernald & Collins*, no. 1068; FIG. 4, fruiting raceme, × 1, from the type region, Shelburne Point, Lake Champlain, Vermont, June 25, 1913, *C. H. Knowlton;* FIG. 5, silique, × 10, showing characteristically smooth valve, from the type region, Lake Champlain, Vermont, July 3, 1902, *W. R. Davis;* FIG. 6, small rosette-leaf, × 10, from Hannah's Head, Newfoundland, *Fernald, Long & Fogg*, no. 1733.

PLATE 315. D. ARABISANS Michx. and var. CANADENSIS (Brunet) Fernald & Knowlton. FIG. 1, portion of fruiting branch, × 1, of short-fruited plant of D. ARABISANS, from Bic, Quebec, *Collins & Fernald*, no. 93 (isotype of *D. megasperma*, var. *leiocarpa* O. E. Schulz); FIG. 2, short fruiting raceme of D. ARABISANS, × 1, from Mt. Ste. Anne, Percé, Quebec, *Fernald & Collins*, no. 1070; FIG. 3, fruiting raceme, × 1, of var. CANADENSIS from Cape Tourmente, Quebec, *Brunet* (ISOTYPE of *D. canadensis* Brunet); FIG. 4, portion of plant, × 1, approaching var. CANADENSIS, from Tucker's Head, Newfoundland, *Fernald, Long & Fogg*, no. 1749; FIG. 5, silique, × 10, of *Collins & Fernald*, no. 93 (isotype of *D. megasperma*, var. *leiocarpa*); FIG. 6, silique, × 10, of ISOTYPE of D. CANADENSIS Brunet.

PLATE 316. D. LANCEOLATA Royle. FIG. 1, portion of slender fruiting plant, × 1, from Bic, Quebec, *Fernald & Collins*, no. 1077; FIG. 2, portion of slender fruiting plant, × 1, from Smoky Head, Bruce Co., Ontario, *Stebbins et al.*, no. 143; FIG. 3, center of basal rosette, × 10, from Mt. St. Pierre, Quebec, *Fernald, Weatherby & Stebbins*, no. 2446; FIG. 4, portion of internode, × 10, from Bic, Quebec, *Fernald & Collins*, no. 1077; FIG. 5, silique, × 10, from Willoughby Mt., Vermont, June 25, 1884, *Faxon.*

PLATE 317. D. LANCEOLATA Royle. FIG. 1, flowering plant, × 1, from Ajan, eastern Siberia, *Tiling*, no. 40; FIG. 2, fruiting plant, × 1, from Songaria, *Schrenk;* FIG. 3, flowering stem, × 1, from Willoughby Mt., Vermont, May 22, 1878, *Pringle;* FIG. 4, portion of fruiting plant from Bic, Quebec, *Rousseau*, no. 26,585; FIG. 5, fruiting plant, × 1, from Fish Lake, Uintah Mts., Utah, *Goodding*, no. 1402 (isotype of *D. valida* Goodding).

PLATE 318. D. LANCEOLATA Royle. FIG. 1, type, × 1, of *D. cana* Rydb., from Morley, Alberta, June 12, 1887, *J. Macoun* (herb. N. Y. Bot. Garden); FIG. 2, lax plant, × 1, from eastern Siberia, *Studendorff.*

PLATE 319. D. BRACHYCARPA Nutt. (FIGS. 1–7), D. BRACHYCARPA, var. FASTIGIATA Nutt. (FIGS. 11 and 12) and D. APRICA Beadle (FIGS. 8–10). FIG. 1, subsimple fruiting plant of D. BRACHYCARPA, × 1, from Sullivan Co., Indiana, *Deam*, no. 26,921; FIG. 2, small-flowered, subsimple plant, × 1, from Jackson, Tennessee, *Bain*, no. 389; FIG. 3, large-flowered, subsimple plant, × 1, from Bedford Co., Virginia, *Curtiss*, no. 178; FIG. 4, small branching plant, with large flowers, × 1, from St. Louis, Missouri, *Engelmann;* FIG. 5, small branching and fruiting plant from Knoxville, Tennessee, *Ruth*, no. 349; FIGS 6, silique, × 10, from no. 349; FIG. 7, septum and seeds, × 10, from no. 349; FIG. 8, fruiting plant (divided), × 1, one of the TYPE specimens of D. APRICA (herb. N. Y. Bot. Gard.); FIG. 9, silique, × 10, from the TYPE; FIG. 10, septum and seed, × 10, from the TYPE; FIG. 11, fruiting plant, × 1, one of the two TYPE specimens of D. BRACHYCARPA, var. FASTIGIATA (herb. N. Y. Bot. Gard.); FIG. 12, silique, × 10, from TYPE of var. FASTIGIATA.

NOTES ON THE FLORA OF NORTHERN NEW YORK

W. C. Muenscher and R. T. Clausen

The material on which these notes are based was collected during the summers of 1930–1933. The species are listed because they are either apparent additions to the New York state flora or the records add to our knowledge of their distribution in this state. The names of the collectors are abbreviated as follows: *C.*, R. T. Clausen; *L.*, A. A. Lindsey; *B.M.*, Bassett Maguire; *M.*, W. C. Muenscher.

Najas gracillima (A. Br.) Magnus. This coastal species was reported by Fernald[1] as occurring locally inland as far as Saratoga County, N. Y. where Svenson collected it in shallow water of the Hudson River above Waterford, in 1922. Since then several other collections have been made from points farther inland: 1930, in Massawepie Lake, St. Lawrence Co., *M. & B.M.*, no. 703; 1931, in Indian River between Rossie and Black Lake, St. Lawrence Co., *M. & B.M.*, no. 1809; 1933, in Russel Pond, St. Lawrence Co., *M. & C.*, no. 3746, and dredged at depth of two meters in Blue Mountain Lake, Hamilton Co., *M. & C.*, no. 3744.

All of this material appears quite typical of the species. The leaf blades are extremely narrow, with the broadened bases both scarious and ciliate. The fruits are slender, rather dull in luster, and roughened by the longitudinal rows of areolae.

Anacharis occidentalis (Pursh) Marie-Victorin. Dredged in two meters of water, Catlin Lake, Hamilton Co., 1932, *M. & L.*, no. 2906; dredged in Long Pond, Catlin Lake, *M. & L.*, no. 2907; Efner Lake, Saratoga Co., *M. & L.*, no. 2908; in shallow water, Algonquin Lake, Hamilton Co., *M. & L.*, no. 2909. Reported by House[2] only from the southeastern part of the state.

Aristida basiramea Engelm. Dry sandy plains by Russel Pond, South Colton, St. Lawrence Co., 1933, *M. & C.*, no. 3976. Middle awns coiled at base, 1.5–1.8 cm. long; lateral awns 6–9 cm. long; glumes 10–11 cm. long.

This grass occurred over a considerable area and seemed well established, with no indication that it had been introduced, although that remains a possibility. There is only one other published record of the occurrence of this species in the East. This is the record of Wheeler[3] who found the plant at Bethel, in the valley of the Androscoggin River, in Maine. Prof. Fernald has kindly informed us, how-

[1] Fernald, M. L. Rhodora, **25**: 105–109. 1923.
[2] House, H. D. New York State Museum Bulletin **254**: 65. 1924.
[3] Wheeler, L. A. Rhodora **31**: 78–79. 1929.

ever, of the following unpublished collections, which cause us to suspect that possibly this *Aristida* is actually native on open arid soils as far east as western Maine. On Aug. 27, 1931, Fernald and Griscom collected the plant on the sandy shores of the Merrimack River at Bedford, N. H. During the summer of 1933, Weatherby and Griscom found it in another township on the opposite bank of the Merrimack in New Hampshire. In 1931, Fernald found the plant in abundance on the open sand plains of Lake Champlain south of Keeseville, N. Y., where it was associated with *Cyperus Houghtonii* and other sand-plain plants and appeared in every way indigenous.

Calamagrostis canadensis (Michx.) Beauv., var. robusta Vasey and var. Langsdorfi (Link) Inman. Specimens collected on the summit of Mount MacIntyre (about 5,000 ft.), Essex Co., *M. & B. M.*, nos. 915 and 916; *M. & C.*, no. 3977 had spikelets which varied from 3.8–4.2 mm. in length, averaging about 4 mm. The margins of the glumes tended to he hyaline. This material falls within the limits of var. *robusta* as outlined by Stebbins.[1] *M. & L.*, no. 2927 from Lake Tear, Mount Marcy, Essex Co., with spikelets measuring from 4–4.5 mm., is probably also var. *robusta*. No. 222 collected in 1930 by Muenscher, Manning and Maguire from near the summit of Mount Whiteface, Essex Co., had spikelets measuring from 4.5–5 mm. in length. This seems to be rather typical var. *Langsdorfi*.

The large-spikelet forms of *C. canadensis* still present a puzzling aspect. The material of var. *Langsdorfi* and of var. *robusta* in the Cornell University Herbarium was studied, using Stebbins' paper as a guide. Only two numbers cited by him as typical of var. *Langsdorfi* were represented by sheets in this herbarium. These were no. 884, *Fernald and Collins*, from Bonaventure Island, Gaspé Co., Quebec, and no. 27488, *Fernald and Long*, from Newfoundland. The spikelets of these sheets were found to average about 4 mm. in length in each case, 3.8–4.4 mm. being the range of variation. This seems to place them within the limits (3.8–4.5) given by Stebbins for var. *robusta*, instead of var. *Langsdorfi*. Several uncited sheets of large-spikelet forms of *C. canadensis* from Newfoundland and Quebec, in the Cornell herbarium were labelled var. *Langsdorfi*, but also had spikelets which came within the limits given by Stebbins for var. *robusta*. There were no sheets from the Northeast in this herbarium, with the exception of the collection from Mt. Whiteface mentioned above, which had spikelets within Stebbins' limits (4.5–6 mm.) for var. *Langsdorfi*.

[1] Stebbins, G. L., Jr. Rhodora 32: 35–37. 1930.

ALLIONIA NYCTAGINEA Michx. Along New York Central tracks at Palatine Bridge, Montgomery Co., *M. & L.*, no. 3242; along roadside, Yosts, Montgomery Co., *M. & L.*, no. 3243; common along Route 5 between Fonda and Canajoharie, two miles west of Fonda, Montgomery Co., *M. & L.*, no. 3241.

RAPHANUS RAPHANISTRUM L. Field near Broadalbin, Fulton Co., 1932, *M. & L.*, no. 3343. A form with white flowers, with veins of petals greenish when fresh, was found growing with the typical yellow-flowered form.

ASTRAGALUS CANADENSIS L. On lake shore, Turnbull's Beach, Black Lake, St. Lawrence Co., 1931, *M. & B. M.*, no. 2358. Reported by House[1] as infrequent from Onondaga, Cayuga and Broome counties westward.

ELATINE MINIMA (Nutt.) Fisch. & Meyer. Submerged on sandy bottom along southeast shore of Osgood Pond, Franklin Co., 1930, *M. & B. M.*, no. 1258. Rather common on sandy shore of Big Wolf Pond in Franklin Co., 1933, *M. & C.*, no. 3912.

MYRIOPHYLLUM FARWELLII Morong. Abundant in shallow water in Bradley Pond, Clinton Co., 1930, *M. & B. M.* no. 1272. Mature carpels with tuberculate ridges. Three collections were made in the Raquette River watershed during 1933: Colton Flow, St. Lawrence Co., *M. & C.*, no. 3916; Beaver Bay of Raquette Lake, Hamilton Co., *M. & C.*, no. 3917; in shallow water of South Bay, Tupper Lake, Franklin Co., *M. & C.*, no. 3918.

DIPSACUS LACINIATUS L. Growing on waste ground west of Saratoga, 1932, *M. & L.*, no. 3636. Previously reported from Albany by House.

Specimens from all of the above collections have been deposited in the herbarium of Cornell University.

CORNELL UNIVERSITY.

NOTES ON VIRGINIA AND MARYLAND PLANTS.—The three following plants collected by the writer during the summers of 1932 and 1933 in the Blue Ridge Mountains of Page County, Virginia, seem to be worthy of record.

MUHLENBERGIA RACEMOSA (Michx.) BSP. This plant was collected at an altitude of about 3500 ft. near Crescent Rocks, just below the edge of one of the cliffs characteristic of the western slope of the Blue Ridge in Page County. The solitary clump was growing in the moist soil near the source of a spring. According to Dr. A. S. Hitchcock, it has not previously been reported from Virginia.

SOLIDAGO RANDII (Porter) Britton. This species is common along the western cliffs above 3500 ft., from Hawkesbill to Stony Man

[1] House, H. D. New York State Museum Bulletin **254:** 444; 657. 1924.

Mountain. It is not cited from this region in Gray's Manual, but has been recorded recently from Virginia by Friesner.[1]

SOLIDAGO MONTICOLA T. & G. A small colony of a white-rayed form of this species was found near Thornton Gap, Virginia.

Additional plants deemed worthy of note, collected by the writer in the summers of 1932 and 1933 in the vicinity of the District of Columbia, are as follows:

SOLIDAGO CANADENSIS var. HARGERI Fernald. The range of this variety can be extended to Virginia and Maryland. Collections were made near Leesburg, Virginia, and at Widewater, Montgomery County, Maryland. There will undoubtedly be other stations in the future near Washington, D. C.

AMBROSIA BIDENTATA Michx. Specimens were collected from a large and flourishing colony of this weed in open woods near Lanham, Prince Georges County, Maryland, where it has apparently been introduced with refuse. Its range, according to Gray's Manual, is "prairies of Illinois to Kansas and southward."

AEGILOPS OVATA L. According to Dr. Hitchcock this grass is a recent introduction on the west coast, and has not previously been reported from elsewhere in the United States. On June 9, 1933, I noticed two plants growing beside an unused cold frame at the governmental farm at Arlington, Virginia. One of these furnished the specimens, and the other unfortunately disappeared shortly after it was discovered.

Specimens of all these plants, except *Solidago canadensis* var. *Hargeri*, have been deposited in the U. S. National Herbarium or in the Gray Herbarium.—MILDRED PLADECK, United States Department of Agriculture, Washington, D. C.

Volume 36, no. 430, including pages 353–376 and plates 314–319, was issued 5 October, 1934.

[1] **Friesner, Ray C. The Genus Solidago in Northeastern North America. Butler Univ. Bot. Studies 3[1]: 46. April, 1933.**

ELEOCHARIS PAUCIFLORA: FIGS. 1 and 3, from Scotland; FIGS. 2 and 5, var. FERNALDII from Maine (TYPE); FIG. 4, from Switzerland; FIG. 6, from Tibet; FIGS. 7, 9 and 10, from Chile (E. ATACAMENSIS); FIG. 8, from California (var. BERNARDINA); FIG. 11, from Washington (var. SUKSDORFIANA).

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CARDAMINE UINTAHENSIS

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Vol. 36. December, 1934. No. 432.

A NEW CARDAMINE FROM THE UINTA MOUNTAINS, UTAH[1]

FREDERICK J. HERMANN

(Plate 322)

THE Uinta Mountains of northeastern Utah, a range 125 miles in length which is isolated from other ranges and possesses a wide variety of soils and habitats within an altitudinal range of 7000 feet (from approximately 6000 to 13,500 feet), might well be expected to embrace more endemic plants than the few at present known to occur there. The Mountains are still largely inaccessible except toward their eastern and western extremities. That the range is as yet very imperfectly known botanically is apparent from Goodman's recent report[2] of the discovery of the Pacific species, *Arenaria cephaloidea* Rydb., *Lesquerella Kingii* Wats. and *Dodecatheon tetrandrum* Suksdorf, and the northern *Mertensia incongruens* McBr. & Payson, among collections from the Bear River Valley,—very appreciable range extensions to the east and south for these species. That some eastern species, too, reach their apparent southwestern limt in the Uintas became evident when the writer collected there, during the summer of 1933, such species new to the State as *Carex misandra* R. Br. (Mt. Emmons, Duchesne Co., alt. 11350 ft., no. 5027), *Carex rupestris* All. (Mt. Emmons, no. 4999), *Carex obtusata* Liljebl. (Carter Creek Canyon, Daggett Co., alt. 8300 ft., no. 4788),

[1] Paper from the Department of Botany and Herbarium of the University of Michigan no. 461. Published with aid to RHODORA from the National Academy of Sciences.

[2] Goodman, G. J. Notes on the Distribution of Some Rocky Mountain Plants. Ann. Mo. Bot. Gard. **18**: 283–286. 1931.

Carex brunnescens (Pers.) Poir. (Chain Lakes, Duchesne Co., alt. 10800 ft., nos. 5183, 5224) and *Juncus alpinus* Vill. (Sheep Creek Canyon, Daggett Co., alt. 6000 ft., no. 4734). The endemic *Penstemon uintahensis* Pennell, a species discovered by Gooding at Dyer Mine in 1902[1] and, as far as can be determined, not since collected, also was found in abundance on the southern slope of Mt. Emmons (nos. 5005 and 5149) growing with *Kobresia Bellardi* (All.) Degland, an elusive little sedge (due to a marked similarity of aspect to its frequent associate *Carex elynoides* Holm) which seems not to have been reported for Utah.

An undescribed Cardamine, unrelated to the other species of the West, was found near the base of Mt. Elizabeth on the north slope of the range. Since it is apparently endemic it may appropriately be known as:

Cardamine **uintahensis**, sp. nov. (tab. 322). Planta perennis, humilis. Rhizoma longum. Caulis humilis, 18–20 cm. altus, strictus, simplex, glaber vel minute pilosus. Folia simplicia, cordata, obtusa, textura crassa firmaque, ea rhizomatis petiolis modice leviterve pilosis, ca. 55 (33–64) mm. longis et laminis glabris late orbiculatis vel reniformibus ca. 23 (14–29) mm. longis, 25 (17–34) mm. latis, levissime sinuatis vel subintegris, ea caulis 6–10, saepe valde purpureo-tinctis, inferiora laminis suborbiculatis vel ovatis leviter inaequaliterque sinuatis et petiolis glabris laminis aequilongis, superiora valde reducta, laminis deltoido-ovatis et valdius sinuatis (saepe fere lobatis), quam petioli longioribus. Racemus 11–16-florus; flores adhuc ignoti. Racemus fructifer ca. 38 (26–48) mm. longus. Siliquae in pedicellis glabris 4–9.5 mm. longis erectae, glabrae, 14.5–20 mm. longae, 1.7–2 mm. latae, lineari-oblanceolatae, abrupte acutae, rostro longo (1.5–2.5 mm.) apice stigmate insigni. Semina fere duplo longiora quam lata (2 x 1.2 mm.).

Perennial with horizontal rootstock; stem simple, strict, 18–20 cm. high, glabrous or very sparingly pilose; leaves all simple, cordate, obtuse, thickish and firm in texture, the basal with moderately pilose petioles ca. 55 (33–64) mm. long, and broadly orbicular to reniform glabrous blades ca. 23 (14–29) mm. long, 25 (17–34) mm. wide, very shallowly sinuate to subentire; cauline leaves 6–10, often strongly purple-tinged, the lower with suborbicular to ovate blades shallowly and irregularly sinuate, and glabrous petioles equalling the blades or nearly so, the upper markedly reduced, their blades deltoid-ovate and more deeply sinuate (often almost lobed), longer than their petioles; raceme 11–16-flowered; flowers unknown; fruiting raceme ca. 38 (26–48) mm. long; siliques 14.5–20 mm. long, 1.7–2

[1] Pennell, F. W. Scrophulariaceae of the Central Rocky Mountain States. Contr. U. S. Nat. Herb. **20**: 350–351. 1920.

mm. wide, glabrous, linear-oblanceolate, abruptly acute, with a long beak (1.5–2.5 mm.) tipped by a conspicuous stigma, on glabrous pedicels less than half their length (4–9.5 mm.); seeds almost twice as long as wide (2 x 1.2 mm.)—Muddy bank of Mill creek at 8500 ft., elevation, S.W. base of Mt. Elizabeth (6 miles S.E. of the Goodman Ranch), Summit Co., Uinta Mts., UTAH, August 13, 1933. *F. J. Hermann*, no. 5894. TYPE in the Gray Herbarium; isotype in the Herbarium of the University of Michigan.

Mill Creek must frequently rise, when swollen with local rains near its source, and overflow the low, flat, muddy bank on which the Cardamine was found, resulting in a habitat unfavorable to most vascular plants. Only four other species were found associated with it, these being, in the order of their abundance: *Sagina saginoides* (L.) Britton, *Epilobium rubescens* Rydb., *Mimulus Tilingi* Regel, and *Carex nubicola* Mackenzie.

Cardamine uintahensis possesses little affinity with the other entire-leaved Cardaminae of the West, of which *C. cordifolia* Gray is the common representative. In its long-beaked, relatively short and broad siliques, its thick, firm leaves which are so markedly reduced toward the inflorescence, and in its dwarf size it is most closely related to the boreal (chiefly northeastern) *C. Douglassii* (Torr.) Britton. From this it differs in its entirely fibrous rather than tuberiferous rootstock; in its more rigid, distinctly petioled, triangular-ovate upper leaves (not at all oblong or dentate-lobed as, commonly, in *C. Douglassii*); in its much shorter fruiting racemes (in *C. Douglassii* 9–23 cm., very rarely only 5 cm., long); in its shorter styles, its relatively much shorter and broader, abruptly-beaked pods which are at least twice the length of their ascending pedicels (the pedicels often longer than the pods in *C. Douglassii*, rarely, if ever, less than half their length, and at maturity much more divergent); and in its seeds, which are decidedly longer than broad (2 mm. long, 1.2 mm. wide in *C. uintahensis*, but those of *C. Douglassii* almost as broad as long, averaging 1.6 mm. by 1.4 mm.). *C. uintahensis* is very strict, almost rigid, in habit, not lax as is, usually, *C. Douglassii*. Its pods are more abruptly beaked than those of any other entire-leaved species.

The only western Cardamine which shows any relation to *C. uintahensis* is *C. Lyallii* Wats., a species of the Cascades and Sierra Nevadas. Part of the original material of this species was received for study from the Gray Herbarium through the kindness of Mr.

C. A. Weatherby. Like *C. cordifolia* it is a rather rank and lax, thin-leaved plant, with the upper leaves scarcely reduced and long pods (averaging 25 mm.) which are linear, gradually acute and very short-styled; so that *C. Douglassii* is clearly the nearest relative of the Uinta Mountain endemic.

University of Michigan.

CAREX DIVISA, TEESDALIA NUDICAULIS AND THLASPI PERFOLIATUM IN MARYLAND

S. F. Blake

Carex divisa Huds. On 30 May 1933 I discovered a thriving colony of this sedge, not before found in America, at Plum Point, Calvert County, Maryland. It grew in the sand around the point of a brackish marsh reaching within about 100 feet of the shore of Chesapeake Bay, the colony extending for perhaps a hundred feet on one side of the marsh and half as far on the other. The hurricanes that visited the coast in the fall of 1933 buried much of the colony under several feet of sand, but the full extent of the damage suffered cannot be estimated until another year. This species is recorded by Kükenthal in the "Pflanzenreich" from a wide range in Europe, Asia, northern Africa, South Africa, and New Zealand (introduced near Auckland), growing in grassy, sandy places, especially in the vicinity of the sea.

In our manuals, *Carex divisa* runs down readily to *Carex arenaria* L., another European species of rare occurrence on our coast in Maryland,[1] Virginia, and Oregon. *Carex divisa* agrees with this species in its long running rootstocks, but is readily separated by the whitish, thin, papery, easily lacerated inner side of the leaf sheath (more or less cartilaginous and brownish in *C. arenaria*); by its much shorter inflorescence, with much shorter basal bract; and by its shorter perigynium (3 mm. long), margined rather than winged, and with a much shorter beak. It bears a closer resemblance to *Carex praegracilis* W. Boott, of western North America. My specimens were identified by Prof. M. L. Fernald.

[1] In Mackenzie's treatment (N. Amer. Fl. **18**: 38. 1931) *C. arenaria* is recorded in the United States only from sea beaches near Norfolk and Buckroe, Virginia, and on ballast at Linton, Oregon. In the U. S. National Herbarium are specimens from the following localities not mentioned by Mackenzie: Ballast grounds, Canton, near Baltimore, Maryland, May, 1891, *Basil Sollers;* old sand dunes, forming loose turf under live-oaks, Hampton, Virginia, 13 May 1903, *G. S. Miller, Jr.*

TEESDALIA NUDICAULIS (L.) R. Br. On 30 April 1933 I collected this little mustard in flower at Plum Point, Calvert County, Maryland, and a month later made a more extensive collection of specimens in mature fruit at the same locality. It grew rather commonly in sandy ground about a hundred feet back from the shore, either in the open or among scattered scrub pines and red cedars, for a distance of one-eighth mile or more. The plant is a glabrous annual only a few inches high, with a rosette of small, deeply pinnatifid basal leaves. The first stem is erect and naked, with a close corymb of small white flowers later developing into a raceme an inch or so long; the later stems, ascending around the first and often surpassing it in height, bear a few small merely toothed leaves. The pods, on spreading pedicels longer than themselves, are suborbicular or obovate-suborbicular, strongly flattened contrary to the partition, glabrous, strongly margined above, notched, and about 2.5 mm. long, with 2 seeds in each cell. The fruit and the whole appearance of the plant suggest at once some unfamiliar *Lepidium;* the principle distinctive character is the presence on the inside of each filament, toward the base, of a cuneate or roundish white scale usually half as long as the filament or more.[1] In Bentham and Hooker's Genera Plantarum the genus was put in a different tribe from *Lepidium*, on the basis of the accumbent rather than incumbent cotyledons. This difference, of course, is not an absolutely constant one (two of our commonest species of *Lepidium* being separated principally by this same distinction), and Prantl's placement of the genus (in the Natürlichen Pflanzenfamilien) in the subtribe Lepidiinae next to *Lepidium* seems more natural. Prantl's description of the seeds as 4 in each cell is incorrect; there are only 2 ovules and 2 seeds in each cell. The generic name is spelled *Teesdalea* by Prantl, but the original and therefore proper spelling is *Teesdalia.*

Teesdalia nudicaulis is not mentioned in Gray's Synoptical Flora or in our manuals. The early collections were all made on ballast about Philadelphia, but recent collections in Massachusetts and New Jersey, as well as my own from Maryland, indicate that the plant is becoming established and deserves a place in our floras. Through the courtesy of the curators of the herbaria at Cambridge (Gray Herbarium and the New England Botanical Club), the New York Botanical Garden, the

[1] The species here recorded, T. *nudicaulis*, is further distinguished from *Lepidium* by having unequal petals, the two outer much larger than the inner; in the other species of the genus, *T. Lepidium* DC., the petals are essentially equal.

Academy of Natural Sciences, Philadelphia, the Missouri Botanical Garden, and the Field Museum, I have assembled the following records of preserved specimens. Only those in the U. S. National Herbarium have been examined by me.

Massachusetts: Sandy soil on edge of Dennis Pond, Yarmouth, 10 June 1916, *J. H. Emerton & H. B. Jackson* (N. E. Bot. Club); abundant in sandy fields, Harwich, 2 July 1918, *M. L. Fernald* 16818 (Gray Herb., and elsewhere); garden weed, Harwich, 14 May 1921, *Fernald* 22981 (N. E. Bot. Club).

New Jersey: Established along roadside adjacent to a cemetery near the village, Palmyra, 14 May 1915, *Bayard Long* 11951 (Acad. Phila); abundant on lawns, paths, and waste ground in cemetery, three-fifths mile south of Palmyra Station, 9 May 1933, *F. J. Hermann* 4105 (Acad. Phila.).

Pennsylvania: On ballast, Girard Point, Philadelphia, 19 April 1878, *C. F. Parker* (Acad. Phila.); same locality [187–?], *Isaac Burk* (Field Mus.); on ballast, Greenwich Point, Philadelphia, May 1878, *C. F. Parker* (U. S. Nat. Herb., Field Mus.); on ballast, Philadelphia, 14 June 1878, *C. A. Boice* (Acad. Phila.), and 1880, *I. C. Martindale* (U. S. Nat. Herb., Acad. Phila.).

Maryland: Low sandy ground back of beach, Plum Point, Calvert Co., 30 April and 30 May 1933, *S. F. Blake* 11654 (U. S. Nat. Herb., and elsewhere).

An explanation of the occurrence of these two European plants at Plum Point is not readily available. Plum Point proper, a small community on the shore of Chesapeake Bay, is known mainly as a locality for Miocene fossils. The locality at which the two plants here recorded were collected, sometimes known as New Plum Point, is a small summer resort which has grown up within a dozen years or so less than a mile up the bay from Plum Point. At neither place have any extensive changes been made in the natural features, nor has either ever been a shipping port.

Thlaspi perfoliatum L. On 8 April 1934 I found this plant abundant in the old road going up the large Indian mound back of the old railroad station at Popes Creek, Charles County, Maryland. At that time it was in flower and young fruit. This species, distinguished from the common *T. arvense* L. by its much smaller, obovate-suborbicular fruit (only about 5 mm. wide) and its essentially uniform, usually entire, sessile and deeply cordate-clasping (but not "perfoliate") stem leaves, has been recorded in North America apparently only from the vicinity of Hamilton, Ontario, and Geneva, New York.

Bureau of Plant Industry, Washington, D. C.

THE GRASS FLORA OF COLUMBIA, MISSOURI

LISLE JEFFREY AND FRANCIS DROUET

DURING the spring and summer of 1933 we have spent considerable time collecting and studying the grasses in this region. The following list is presented as the result of the first year's work and should be appended to Rickett's *Flora of Columbia* (Univ. Mo. Stud. **6**(1). 1931), together with a few additions made previously in RHODORA **35**: 361–362. Reference is made below to the earlier Columbia *Flora* of Daniels (Univ. Mo. Stud. Sci. Ser. **1**(2). 1907) and to Bush's revision of the grasses of the Daniels herbarium (Amer. Midl. Nat. **12**: 343 ff. 1931). Names of species preceded by an asterisk (*) in the list below are reported as collected for the first time in the flora. We wish to thank Mr. B. F. Bush, Dr. W. E. Maneval, and Dr. J. A. Steyermark for their cooperation during the course of the work.

AGROSTIS STOLONIFERA L. *A. alba* of Amer. Auth. and of the Columbia *Floras*, not L. Including *A. alba* var. *vulgaris* of Daniels, Bush, and Rickett. Most of the specimens can be distinguished as var. MAJOR (Gaud.) Farwell. See Ann. Rep. Nat. Mus. Canada, Dept. Mines Bull. **50** (1926): 122. 1928.

AGROSTIS PERENNANS (Walt.) Tuckerm. Including *A. Schweinitzii* Trin. Several new stations have been found for the typical form.

ARISTIDA BASIRAMEA Engelm. On a freshly cut hillside near Rocky Fork Creek northwest of Columbia, *Drouet 967*, Aug. 16, 1933. Not Daniels' *A. basiramea.*

*ARISTIDA LONGESPICA Poir. *A. gracilis* Ell. Roadside eight miles north of Columbia, *Jeffrey 246*, Sept. 6; loess ridges on the Roby Farm south of Rocheport, *Jeffrey 253*, Sept. 8; along railroad north of Hallsville, *Jeffrey 300*, Sept. 16; Richland Road, *Jeffrey 325*, Sept. 27; Highway C near Harrisburg, *Jeffrey 331*, Sept. 22, 1933. See Contrib. U. S. Nat. Herb. 22(pt. 7): 538, 539. 1924.

*CYNODON DACTYLON (L.) Pers. Established in parkings and waste ground in Columbia, where it has escaped from lawns. One specimen is from West Broadway near East Parkway, *Jeffrey 316*, Sept. 22, 1933. First observed here by Dr. Steyermark.

ELYMUS CANADENSIS L. *E. robustus* Scribn. & J. G. Sm. The typical form and f. GLAUCIFOLIUS (Muhl.) Fernald (var. *glaucifolius* Gray) have been collected abundantly during the past year. See RHODORA **35**: 191. 1933.

ELYMUS VIRGINICUS L. var. TYPICUS (Scribn.) Fernald and the f. HIRSUTIGLUMIS (Scribn.) Fernald (var. *hirsutiglumis* Hitchc.). Both forms are well represented in the collections of the past season. See RHODORA **35**: 198.

ELYMUS VIRGINICUS L. var. GLABRIFLORUS (Vasey) Bush. *E. glabriflorus* Scribn. & Ball. *E. glabrifolius* of Rickett's *Flora.* Abun-

dantly collected. Forma AUSTRALIS (Scribn. & Ball) Fernald (*E. australis* Scribn. & Ball) is represented by a typical specimen, among others, from Providence, *Jeffrey 211*, Aug. 24, 1933. See RHODORA **35**: 198.

*ERIOCHLOA CONTRACTA Hitchc. *E. punctata* Hamilt. Pasture east of the Sheep Barn on the University Farm, Columbia, *Jeffrey 156*, Aug. 22, 1933.

FESTUCA OCTOFLORA Walt. var. TENELLA (Willd.) Fernald, RHODORA **34**: 209. 1932. From dry woods near the sandstone bluffs of Hinkson Creek, *G. W. Bohn*, May 9, 1933. To this variety is also referred for the present an over-mature specimen from an outcrop of sandstone northeast of Claysville, Boone Co., *Jeffrey 352*, Sept. 30, 1933. *F. octoflora* Walt. (*F. tenella* Willd.) is reported by Daniels (*Flora*, p. 97) as rare on the bluffs of Grindstone Creek, but his specimens have not been seen.

KOELERIA CRISTATA (L.) Pers. Found also in the County Road Prairie, Callaway Co., *Jeffrey & Drouet 478, 481*, June 3, 1933.

MUHLENBERGIA RACEMOSA (Michx.) BSP. Found this season only along the M. K. & T. railroad tracks: Providence, *Jeffrey 209*, Aug. 24; south of Rocheport, *Jeffrey 234*, Sept. 1; Claysville, *Jeffrey 348*, Sept. 30, 1933. Reported by Daniels, but no specimen has been found in his herbarium.

MUHLENBERGIA TENUIFLORA (Willd.) BSP. Two Columbia specimens were placed here by Bush and by Rickett: *Daniels*, Sept. 1904, and *A. Saeger*, Sept. 11, 1919. Neither sheet bears a superabundance of spikelets. The Daniels specimen has, in part at least, lanceolate glumes as long as the lemmas and is referred for the present to M. UMBROSA Scribn. (*M. sylvatica* Torr.). Likewise *Jeffrey 330* is placed in *M. umbrosa*. The status of these two species in our flora cannot be determined until more field observations have been made and more specimens accumulated.

PANICUM LANUGINOSUM Ell. var. FASCICULATUM (Torr.) Fernald. *P. huachucae* Ashe and the var. *silvicola* Hitchc. & Chase. *P. tennessense* Ashe, in part. See RHODORA **23**: 228, and RHODORA **36**: 77.

PANICUM LANUGINOSUM Ell. var. SEPTENTRIONALE (Fernald) Fernald. *P. tennessense* of various authors, in part, not Ashe? Ridge east of Honeysuckle Spring, south of Pierpont, *Jeffrey*, June 24, 1933; low ground along Hinkson Creek near the sandstone bluffs, *Jeffrey*, July 29, 1933. See RHODORA **23**: 228 and **36**: 77.

*PANICUM MULTIFLORUM Ell. *P. polyanthes* Schultes. Chert barrens along an old lane west of Browns Station, *Drouet* 879, Aug. 2, 1933; *Jeffrey 291*, Sept. 16, 1933. See RHODORA **14**: 172. 1912.

*PANICUM OLIGOSANTHES Schultes var. SCRIBNERIANUM (Nash) Fernald. *P. Scribnerianum* Nash. Hill above the tunnel in Howard Co., at Rocheport, *Drouet 428*, May 30; County Road Prairie, Callaway Co., *Drouet 482*, June 3; river bluffs south of Rocheport, *Jeffrey 251*, Sept. 8, 1933. See RHODORA **36**: 80. 1934.

*Paspalum circulare Nash. Widely distributed, mostly in low ground, in the Columbia region. A typical specimen is from the bed of Hinkson Creek eight miles north of Columbia, *Jeffrey 241*, Sept. 8, 1933.

Sporobolus asper (Michx.) Kunth. New collections: by University Avenue east of William Street, Columbia, *Jeffrey 308*, Sept. 19; by railroad beneath Stewart Bridge, Columbia, *Jeffrey 313*, Sept. 22, 1933.

Sporobolus cryptandrus (Torr.) Gray. River bluff at Providence, *Jeffrey 206*, Aug. 24; river bluffs south of Rocheport, *Jeffrey 255*, Sept. 8, 1933. Reported by Tracy (see Daniels' *Flora*, p. 245).

*Sporobolus neglectus Nash. Bluffs of Hinkson Creek east of Fellows' Quarry, Columbia, *Jeffrey 276*, Sept. 15, 1933; river bluffs at Claysville, Boone Co., *Jeffrey 350*, Sept. 30, 1933. See Rhodora **35**: 109. 1933.

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AGROPYRON TRACHYCAULUM VERSUS A. PAUCIFLORUM

M. L. Fernald

In 1932, the late Dr. Malte[1] showed that the North American plant which had been passing as *Agropyron tenerum* Vasey (1885) was properly described more than a century ago as *Triticum trachycaulum* Link (1833). Malte greatly helped clarify the point by publishing a plate showing the type; and he correctly made the combination *A. trachycaulum* (Link) Malte (1932). In my study published in May, 1933, I cited,[2] as a synonym of *A. trachycaulum*, *Triticum pauciflorum* Schweinitz in Keating, Narr. Long's 2d Exped. ii. 383 (1824), not *A. pauciflorum* Schur (1859).

The type of Schweinitz's species is a very characteristic specimen at the Academy of Natural Sciences of Philadelphia and studied by me in 1932;[3] but I purposely avoided making a new combination under *Agropyron*, based on *T. pauciflorum* Schwein. (1824), because of the "homonym rule" put through[4] at Cambridge by Professor Hitchcock and those who thought with him in order to clarify nomenclature. The rule as adopted at Cambridge was

[1] Malte, Ann. Rep. 1930, Nat. Mus. Can. 42 (1932).
[2] Fernald, Rhodora, xxxv. 163, 169 (1933).
[3] Fernald, l. c. 168 (1933).
[4] For discussion at Cambridge see Fifth Internat. Bot. Congr. Rep. Proc. 598–605 (1931).

A name of a taxonomic group is illegitimate and must be rejected if it is a *later homonym*, that is if it duplicates a name previously and validly published for a group of the same rank based on a different type. Even if the earlier homonym is illegitimate, or is generally treated as a synonym on taxonomic grounds, the later homonym must be rejected.

In view of this rule, an alteration of the original International Rules for which Professor Hitchcock firmly stood, it is, therefore, surprising to see in Silveus, Tex. Grasses, 158 (Nov., 1933) and in more regular form in a paper by Hitchcock in March, 1934, the new combination *Agropyron pauciflorum* (Schwein.) Hitchc.

Agropyron pauciflorum (Schwein.) Hitchc.
Triticum pauciflorum Schwein. in Keating, Narr. Exp. St. Peter's Riv. **2:** 383. 1824.
Triticum trachycaulum Link, Hort. Berol. **2:** 189. 1833.
Agropyron tenerum Vasey, Bot. Gaz. **10:** 258. 1885.
Agropyron trachycaulum Malte, Nat. Mus. Canada, Ann. Rep. **1930:** 42. 1932.

Schweinitz cites "Prairies of the St. Peter" [Minnesota], collected by Thomas Say in 1823. The description leaves no doubt of the identity of the species, though the type was not found in the herbarium of the Academy of Natural Sciences, Philadelphia, where most of the Say collections are preserved. *Agropyron pauciflorum* (Schwein.) Hitchc. is not invalidated by *A. pauciflorum* Schur because that was not effectively published.[1]

The reason for the new *Agropyron pauciflorum* is stated in a footnote from the citation of *A. pauciflorum* Schur: "Verh. Siebenb. Ver. Naturw. **10**: 77. 1859, as synonym of *A. caninum* Roem. & Schult."

That *Agropyron pauciflorum* Schur was not published as an *absolute* "synonym of *A. caninum*" but was a different plant "based on a different type" is reasonably clear; that it has been regularly interpreted as different from *A. caninum* is shown by the treatment of it by such discriminating botanists, familiar with it, as Fuss, Fritsch, Heimerl and Ascherson & Graebner.

Schur, publishing lists of the interesting plants collected on different excursions in Siebenbürgen, gave new binomials to a number of new plants discovered. With complete disregard (and ignorance) of the rules to be passed after his death he, like many good systematists of his period, was not over-fastidious as to whether his binomials applied to species or to varieties. Thus we find on his p. 61

19. Podospermum Jacquinianum *Koch?* var. insignis, vel nova species = **P. heteropyllum** *mihi;* foliis radicalibus; [etc. (a clear diagnosis)].

[1] Hitchc. Am. Journ. Bot. xxi. 132 (March, 1934). Professor Hitchcock seems not to have seen my discussion of the type of *Triticum pauciflorum* above noted.

On p. 84 he listed *Ranunculus flabellifolius* Heuffel and had a variety

> **R. flabellifolius** *Heuff.* var. **b. partitus,** i. e. foliis caulinis ad tertiam partem 3–5 partitis, partitionibus antice plerumque 3 dentatis. **R. Psuedo-Villarsii** *mihi.*

Throughout his paper Schur showed the same indecision as to whether special plants were to be treated as varieties or as species; but in any case he gave them binomials. So, when he came to *Agropyron* from the limestone Thordaer Hassadék, he was equally undecided:

> **103. Agropyron caninum** *R. S.* var. calcarea, spiculis 2–3 floribus = **A. pauciflorum** *mihi.*

In view of the very clear characterization of *Agropyron caninum* by Roemer & Schultes as "subquinquefloris" and the consensus of European descriptions of *A. caninum* as having, to use Ascherson & Graebner's words, "Aehrchen meist 4– bis 6 blüthig" or (in var. *majus* Baumg.) "7– bis 9 blüthig," it should be evident that, when Schur gave the name *A. pauciflorum* in 1859 to a new plant with 2–3-flowered spikelets, he was not at all publishing a "synonym of *A. caninum* Roem. & Schult." As already stated, European students of the grasses do not so consider it. Thus Fuss, Fl. Transsilv. Exc. 750 (1866), treated *A. caninum "spiculae plerumque 5-florae"* and definitely made

> *β.* p a u c i f l o r u m *Schur: spiculae 2–3-florae.*

Hookerfil. & Jackson, Ind. Kew. i. 61 (1893) treated it unequivocally as a distinct species; Ascherson & Graebner, Syn. ii[1]. 643 (1901) separated it, on the very characters given by Schur, as *Triticum caninum,* var. *pauciflorum* (Schur) Aschers. & Graeb.; Fritsch, Exkursionsfl. Österr. ed. 2: 80 (1909), maintained it as a species, "A. pauciflorum Schur (*N*)" (making the new combination obviously because of doubt as to the status of Schur's name); and it is kept up either as a species or a variety by later authors: Heimerl and others. There is, then, no room, under the International Rules, the American Code or any rules known to me, for a second *A. pauciflorum* published in 1934 (or in 1933).

As to the combination *Agropyron trachycaulum,* it should, apparently, be cited as of (Link) Malte (1932), where the transfer was properly made. The earlier uses of *A. trachycaulum* were in synonymy: *A. trachycaulum* (Link) Steud. Syn. Pl. Gram. i. 344 (1854) in the

synonymy of *Triticum trachycaulum; A. trachycaulum* (Link) Candargy, Étude Mon. Tribu Hord. 43 (1901) in the synonymy of *A. Richardsoni.* Steudel ascribed the name *A. trachycaulum* to "*Hort,*" Candergy to "Host"; the combination, therefore, may have been properly made before Malte's publication. I have thus far failed to trace it to Host.

Two Introduced Grasses new to Virginia—Eriochloa contracta Hitchc. On 7 August 1933 I collected a single small specimen of this plant in the center of a new, unfinished highway near Glencarlyn, Arlington County, Virginia. This species has hitherto been known from Missouri and Kansas to Louisiana, Texas, and New Mexico, so that this appears to be its first occurrence outside what may be considered its natural range. Growing only a few feet from the *Eriochloa* was a single clump of about 30 culms of *Eragrostis hirsuta* (Michx.) Nash, a species not previously found in the District of Columbia region, and of rare occurrence north of North Carolina. There are specimens of it in the U. S. National Herbarium from Chesapeake Beach, Maryland, 3 Sept. 1929, *J. B. S. Norton* 36; railroad west of Lightfoot, James City County, Va., 27 Sept. 1921, *E. J. Grimes* 4494; Fort Monroe, Va., 1879, *G. Vasey;* Norfolk, Va., 5 Aug. 1895, *T. H. Kearney* 295b.

Eulalia viminea (Trin.) Kuntze. On 20 October 1931 I found a good-sized clump of this eastern Asiatic grass on the beach of James River at City Point, Prince George County, Virginia. It has not previously been recorded from America, but there is a sheet in the National Herbarium collected on river bank near Third Creek, Knoxville, Tennessee, 9 October 1919, by G. G. Ainslee.

I am indebted to Mrs. Agnes Chase and Prof. A. S. Hitchcock for the identification of the grasses here recorded, all of which have been placed in the United States National Herbarium; specimens of the *Eragrostis* and *Eulalia* have been distributed to other herbaria.—
S. F. Blake, Bureau of Plant Industry, Washington, D. C.

Calopogon pulchellus from Oklahoma.—From a prairie in the eastern end of Oklahoma, about one-half mile northwest of Panama, Le Flore County, came a plant to this herbarium, collected by Miss

Beulah McInturff. The plant was, as the collector had suspected, the handsome grass-pink, *Calopogon pulchellus* (Sw.) R. Br. This collection was made on May 7, 1934. Shortly there came additional material from Miss McInturff, collected five days later in the same locality, with the note that, although the orchid had not been noticed during the two preceding years that the collector had lived there, it was fairly abundant this spring.

This is the first time that this genus has been collected in Oklahoma. The current manuals cite the range as being from Newfoundland to Florida and west to Minnesota and Missouri.—George J. Goodman, University of Oklahoma, Norman, Oklahoma.

Flora of Iceland and the Faeroes.—The handy little volume[1] on two northern regions which are more and more attracting the tourist will be welcomed by them. The senior author, the late Professor Ostenfeld, had had much experience with northern floras and before his premature and most regrettable death had completed half the manuscript; his successor in carrying through the enterprise has satisfactorily finished the work. In form it is a series of diagnostic keys, without great elaboration, making a pocket-volume of about 200 pages. The treatment is conservative, or ultraconservative at points, as to generic and specific lines (to the extent of throwing *Ammophila* back into *Calamagrostis*, *Agropyron* into *Triticum* and *Phyllodoce* into *Bryanthus*) but at other points going to the opposite extreme (in segregating *Viscaria* and *Melandrium* from *Lychnis* and *Erophila* from *Draba*). With simple descriptive English and a good glossary, the book can be used by the amateur of ordinary intelligence. It is too bad, therefore, that the authors so frequently set their own views against international procedure in regard to names. Too frequently they have felt impelled to *improve* upon the original spellings of generic and specific names. The International Rules of Botanical Nomenclature are explicitly opposed to the taking of these individual liberties; nevertheless, such names as *Equisetum sylvaticum* and *Geranium sylvaticum* are altered, as many Europeans insist on doing, to *E. silvaticum* and *G. silvaticum*, in spite of the consistent use by Linnaeus of SYL. When this impulse to "correct" the original author extends to the spelling of generic names it helps the perpetuation of error. *Cryptogramma*, *Eleocharis* and *Corallorrhiza* were all so spelled by their author, Robert Brown, first Keeper of Botany at the British Museum, who so thoroughly understood what he was about that Humboldt graciously called him "botanicorum facile princeps." Nevertheless, they here appear as the "corrected" *Cryptogramme*, *Heleocharis* and *Coralliorrhiza*, suggesting that Humboldt's estimate of Brown is not always accepted as applying to his Greek. In fact, the "correction" of Brown's *Cryptogramma* to the unallowable *Cryptogramme* was made by Sir William Jackson Hooker, then Director of

[1] C. H. Ostenfeld and Johs. Grøntved. THE FLORA OF ICELAND AND THE FAROES. 195 + xxiv pp., 2 maps. Levin & Munksgaard, Nörregade 6, Copenhagen. 1934.

the Royal Botanic Garden at Kew, in 1858 (Sp. Fil. ii. 126); in 1829, Dr. William Jackson Hooker, Professor in the University of Glasgow, had followed Brown in calling it *Cryptogramma* and he then referred to him as "the greatest Botanist of this or any other age or country" (Icon. Fil. t. clviii)!

Another point difficult to understand is the maintenance of *Selaginella selaginoides* (L.) Link (p. 2) but the exclusion of *Cerastium cerastioides* (L.) Britton (p. 59) and *Sagina saginoides* (L.) Dalla Torre (p. 63). These and other similar matters are not of first importance, but they, along with parallel departures at other European centers, make one wonder, WHO FOLLOWS THE RULES?

A check of the components of the flora of Iceland and the Faeroes shows it to be prevailingly European, with only a trace (outside the circumpolar species) of a distinctively American element, in *Habenaria hyperborea*. The definitely European character of the flora (and the treatment of it), as contrasted with the flora of climatically similar areas in North America and the largely North American flora of Greenland is shown by *Antennaria*, represented by 1 species, and by *Hieracium*, occupying 22 pages, with 81 species and varieties. American botanists who wish a change from *Antennaria*, *Rubus*, *Crataegus* and *Panicum* may get it by collecting *Hieracia* in Iceland. They can now go to Iceland and the Faeroes with the assurance that they have a well constructed and handy Flora to aid them.—M. L. F.

Vol. 36, no. 331, including pages 377–408 and plates 320 and 321, was issued 3 November, 1934.

ERRATA

Cover, nos. 421 and 422, line 6; *for* **FEANKLIN** *read* **FRANKLIN**.
Cover, no. 422, line 19; *for* **Polygonum** *read* **Polygonatum**.
Page 39, lines 27 and 28; *for* **floridana** (Schwein.), n. comb. *read* FLORIDANA (Schwein.) Kükenth.
Page 48, line 31; *omit* endemic.
Page 52, line 27; *for* DECANGULARE L. *read* COMPRESSUM Lam.
Page 54, last line; *for* 6138 *read* 6145.
Page 225, line 1; *for* CALLOSUM *read* CALLOSA.
Page 239, line 18; *for* Q. *read* Quercus.
Page 246, line 12; *for* fallicies *read* fallacies.
Page 247, line 6; *for* nich *read* nicht.
Page 249, lines 17 and 18; for *cinera* read *cinerea*.
Page 253, line 7; *for* complete *read* incomplete.
Page 278, line 34; *for* TRANSLANTICA *read* TRANSATLANTICA.
Page 282, line 5; *for* JOHANNANSIS *read* JOHANNENSIS.
Page 283, line 17; *for* URVA *read* UVA.
Page 285, explanation of Map 1; *for* ARNICA *read* DRABA.
Page 293, line 26; *for* with a marked variety in Gaspé *read* and adjacent southeastern Labrador.
Page 306, line 43; *omit* 5.
Page 307, line 23; *for* 6 *read* 2.

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